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Class

NEW YORK AIR BRAKE.

SUPPLEMENT TO

"THE SCIENCE OF RAILWAYS"

BY

MARSHALL MONROE KIRKMAN.

PUBLISHED BY

THE WORLD RAILWAY PUBLISHING COMPANY.

Illustrating and Explaining the Workings
of the New York Air Brake.

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THE AIR BRAKE AND ITS WORKINGS.

The vast and unexampled use of the Air Brake makes a clear knowledge of it of vital importance to everyone actively interested in the movement of trains. In order to bring this about more fully, I have prepared, as a supplement to "THE SCIENCE OF RAILWAYS" the accompanying plates and descriptive matter, illustrating and explaining the QUICK ACTION AUTOMATIC COMPRESSED AIR BRAKE OF THE NEW YORK AIR BRAKE COMPANY.

It embraces the latest improved appliances of that Company.

The diagrams, therefore, will be found especially interesting and valuable to all who have occasion to use or make a study of such matters.

Nothing could be more clear than the cuts and the explanations that accompany them, as they have in the main been prepared under the immediate eye of the New York Air Brake Company.

The student will find illustrated and described the most important parts of the New York Air Brake, viz.: Air Pump, Engineer's Valve, Triple Valves, Governor and Drain Cup or Brake Pipe Strainer; also the various parts of their Standard Air Brake and the details of each complete equipment. The general plan of the brake, and its application to locomotives and cars, are also graphically shown in drawings prepared for that purpose. For a list of these illustrations the reader is referred to the table of contents.

In Volume 1, Chapter 6, of "The Science of Railways," the evolution of the brake is illustrated, followed by a carefully prepared account, with attendant cuts, of the air brake and its construction and management. It is again referred to with considerable particularity in Volumes 4 and 12 of the same work. This supplement, I beg to state, is not intended to supersede what is said in "The Science of Railways" in regard to the air brake, but to be auxiliary thereto, for the better elucidation of this very complex and important feature in the operation of trains and in the mechanical department of railroads.

Detailed rules and information on the following points will be found in "The Science of Railways," in the volumes and at the pages indicated:

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M. M. KIRKMAN.

Principle of Operation.

The "Air Brake" provides means for generating power, and making it effective upon the wheels of each vehicle at practically the same instant of time. It is, in fact, an automatic appliance for quickly and safely stopping a railway train to suit conditions of service both *usual* and *unusual.*

The engineer, by simple movements of a small handle in the cab, operates and has full control of the brakes under all circumstances within his knowledge, but their action is entirely *automatic* and *independent* of the engineer if the train breaks in two, a coupling hose bursts, or a similar accident occurs. On passenger cars, the brake can also be applied by any of the trainmen, if necessary.

The "*automatic*" action is obtained by providing each vehicle with a supply of compressed air that is always ready for instant use, and by means of which the shoes are forced against the wheels, or withdrawn from them, as desired. This air supply, kept at a pressure of 70 lbs. per sq. in., is stored in the reservoir upon each car, and in the train pipe connecting them, the apparatus being so constructed that a *reduction of train pipe pressure* will apply brakes, and an *increase* (restoring what has been used) will release them. Ordinarily, this reduction of train pipe pressure is made through the engineer's valve, but if air is permitted to escape from the train pipe by *any cause,* the brakes apply automatically. If the train breaks in two, this automatic action occurs upon *both* sections.

The "*quick action*" is so called to distinguish its effect from the work which the brake performs in ordinary service. For instance, when stopping the train at stations, or otherwise as required in daily service, the engineer *graduates* the power upon the wheels, thus applying the brakes with whatever force may be necessary, lightly or otherwise, but in an emergency, when life or property is in danger, the *full* brake power is *instantly* at work throughout the train, thus bringing it to a stop in the shortest possible distance.

Improved Car Drain Cup and Strainer.

This improved device, illustrated on Plate Q 33, meets all requirements that have been suggested as desirable. The strainer is mounted on a removable spider 36, which may be unscrewed and the strainer thus examined, cleaned or renewed *without breaking a pipe joint.* The strainer 35 is placed at the top where water or dirt rolling along the pipe cannot reach it. It is in a recess that shields it from flying missiles. The drainage pocket is open to catch all dirt, and may be emptied by unscrewing plug 32. This device may replace the older form of drain cup on the same pipe threads, as the connections are the same.

For Special Drain Cup, see Plate Q 34.

[illegible]

[illegible]

No. 2

Duplex Air Pump.

* * *

Plate Q 1 shows the No. 2 size, which is adapted for passenger locomotives hauling long trains, and for freight service. It works with a smoothness and ease of operation in strong contrast to the ordinary single cylinder air pumps, the absence of jarring and noise being particularly noticeable, and will supply air more rapidly. The valve gear is very simple and every part of it can be examined by unscrewing a plug. The advantages in convenience and durability are, therefore, evident.

In this pump, the steam cylinders form the lower half, with the air chambers above them. Condensation from the steam cylinders therefore drains away naturally, and the compressed air delivered is as clean and dry as possible.

The action of the duplex pump in compressing air is similar to the use of steam in a compound engine, the air being compounded instead of steam, and results in a corresponding economy. Each steam cylinder is of 7 inch diameter. The high pressure air cylinder is also of 7 inch diameter, but the low pressure air cylinder is 10 inches, and its capacity is, therefore, twice that of the steam cylinder actuating it. Each air cylinder fills with free air *at every stroke*, as described below.

The first operation forces air from the larger air cylinder to enter the smaller one, in addition to the free air already in it, thus compelling the smaller cylinder to contain three times its volume of free air, compressed to about 40 pounds. The high pressure pistons then complete the compression and force this air into the reservoir. In this way, the two 7 inch steam pistons are caused to actuate the equivalent of three 7 inch air pistons (the area of a 10 inch piston being double that of the 7 inch size). In other words, *two measures of steam* are made to *compress three similar measures of air.*

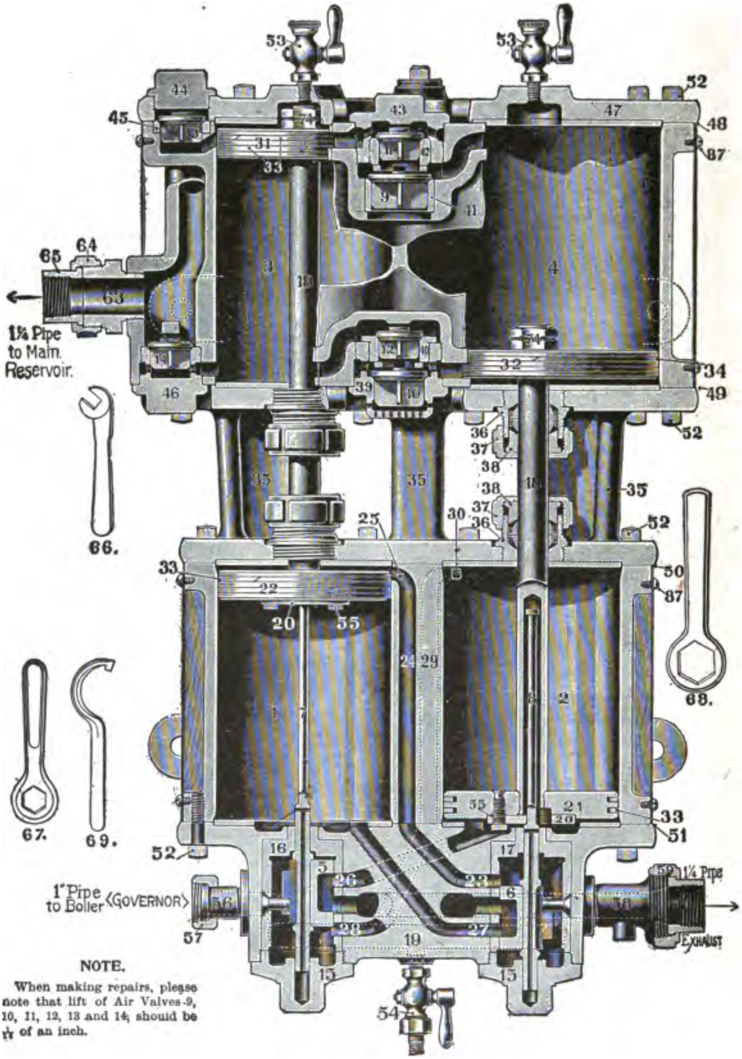
The valve gear is very simple. For the steam cylinders it consists of two plain D slide valves, 5 and 6, moving in steam chests, 16 and 17, and operated by small tappet rods, 7 and 8, which extend into the hollow piston rods of the steam cylinders. As is shown, the valve on one side controls the supply of steam to the opposite side. The air valves are simple check valves, *which seal by gravity while the pistons wait*, and, therefore, are not liable to pound themselves to pieces. (The pistons of one side rest while the pistons of the other side are in motion.) The operation is as follows:—

In the position shown, the air piston in cylinder 4 has completed its downward stroke and compressed its contents through valve 12 into cylinder 3. The plate 20, on steam piston 21, has moved valve 6 to its lowest position. *This admits steam through port* 23, 24, 25, *to upper side of piston* 22, and will cause that piston to descend and expel the partially compressed air in cylinder 3, through valve 14 and passage shown, into the reservoir. Meanwhile, the cylinder 4 has become filled *above* the piston with air at atmospheric pressure through valve 9, and the cylinder 3 will be filled with air at atmospheric pressure through valves 9 and 11, both of which open inward, and are seated by gravity. When piston 22 reaches the end of its downward stroke, the plate 20 strikes the tappet on valve stem 7 and moves valve 5 to its lowest position, thus uncovering port 26 and *admitting steam to the lower side of piston* 21, causing piston 21 to rise and compress the air which is in cylinder 4, through valve 11 into upper part of cylinder 3. Just as piston 21 completes its stroke, its plate 20 strikes the tappet on valve stem 8 and moves valve 6 to its highest position, uncovering port 27 and *admitting steam to the lower side of piston* 22, causing that piston to rise and expel the partially compressed air in cylinder 3, through valve 13 into passage shown, and thence into the reservoir. While the pistons are compressing the air above them into the reservoir, the air cylinders below the pistons will be filled with air at atmospheric pressure through valves 10 and 12, ready for another cycle of operation.

Compared with the ordinary single cylinder pumps, which have the steam and air cylinders of the same size, and, therefore, compress one measure of air with one measure of steam, our Duplex Pump, which compresses three measures of air with but two measures of steam, has 50 per cent. greater efficiency.

No. 2 Duplex Air Pump.

PLATE Q 1.



NOTE.

When making repairs, please note that lift of Air Valves 9, 10, 11, 12, 13 and 14 should be $\frac{1}{16}$ of an inch.

Steam and Exhaust openings are now provided on both sides of the pump, so that it can be placed on either the right or left side of the locomotive, by simply changing plugs. It is arranged for the right hand side, unless otherwise specified.

Parts of No. 2 Duplex Air Pump.

PLATE Q 1.

No.	
1–2	Steam Cylinders.
3–4	Air Cylinders.
5–6	Slide Valves (2 pieces).
7–8	Valve Stems (2 pieces).
9–10	Receiving Air Valves (2 pieces).
11–12–13–14	Discharge Air Valves (4 pieces).
15	Steam Chest Caps (2 pieces).
16–17	Steam Chest Bushings. (Specify "right" or "left.")
18	Piston Rods (2 pieces), (includes 1 each of Nos. 20-21, and 2 each of Nos. 33–55–74)
19	Steam Head (includes Nos. 5–6, 16, 17, and 2 of No. 15).
20	Tappet Plates (2 pieces).
21–22	Seven-inch Steam Pistons (includes 1 each of Nos. 18–20, and 2 each of Nos. 33–55–74).
31	Seven-inch Air Piston (includes 2 of No. 33).
32	Ten-inch Air Piston (includes 2 of No. 34).
33	Seven-inch Piston Rings (6 pieces).
34	Ten-inch Piston Rings (2 pieces).
35	Centre Piece (includes 4 of No. 36).
36	Stuffing Boxes (4 pieces).
37	Stuffing Box Nuts (4 pieces).
38	Stuffing Box Glands (4 pieces).
39	Lower Receiving Valve Chamber.
40	Lower Intermediate Valve Seat.
41	Upper Receiving Valve Seat.
42	Upper Intermediate Valve Seat.
43	Upper Intermediate Valve Chamber.
44	Upper Discharge Valve Cap.
45	Upper Discharge Valve Seat.
46	Lower Discharge Valve Seat.
47	Top Head.
48	Upper Air Cylinder Gasket.
49	Lower Air Cylinder Gasket.
50	Upper Steam Cylinder Gasket.
51	Lower Steam Cylinder Gasket.
52	Cylinder Head Bolts (62 pieces).
53	Oil Cups (2 pieces).
54	Drain Cock.
55	Tappet Plate Bolt (4 pieces).
56	Governor Union Stud.
57	Governor Union Nut.
58	Exhaust Union Stud.
59	Exhaust Union Nut.
60	Exhaust Union Swivel.
63	Air Union Stud.
64	Air Union Nut.
65	Air Union Swivel.
66	Cylinder Head Bolt Wrench.
67	Cap Wrench.
68	Valve Chamber Wrench.
69	Packing Nut Wrench.
74	Piston Rod Nut.
87	Jacket Screws.

No. 1

Duplex Air Pump.

* * *

Plate Q 2 shows the No. 1 size, which is adapted for small locomotives. It is constructed the same way as the No. 2 pump, and the description and operation are, therefore, similar. Our duplex pumps work with a smoothness and ease of operation in strong contrast to the ordinary single cylinder air pumps, the absence of jarring and noise being particularly noticeable, and will supply air more rapidly. The valve gear is very simple and every part of it can be examined by unscrewing a plug. The advantages in convenience and durability are, therefore, evident.

In this pump, the steam cylinders form the lower half, with the air chambers above them. Condensation from the steam cylinders therefore drains away naturally, and the compressed air delivered is as clean and dry as possible.

The action of the duplex pump in compressing air is similar to the use of steam in a compound engine, the air being compounded instead of steam, and results in a corresponding economy. Each steam cylinder is of 5 inch diameter. The high pressure air cylinder is also of 5 inch diameter, but the low pressure air cylinder is 7 inches, and its capacity is, therefore, twice that of the steam cylinder actuating it. Each air cylinder fills with free air *at every stroke*, as described below.

The first operation forces air from the larger air cylinder to enter the smaller one, in addition to the free air already in it, thus compelling the smaller cylinder to contain three times its volume of free air, compressed to about 40 pounds. The high pressure pistons then complete the compression and force this air into the reservoir. In this way, the two 5 inch steam pistons are caused to actuate the equivalent of three 5 inch air pistons (the area of a 7 inch piston being double that of the 5 inch size). Therefore, *two measures of steam* are made to *compress three similar measures of air.*

The valve gear is very simple. For the steam cylinders, it consists of two plain D slide valves, 5 and 6, moving in steam chests, 16 and 17, and operated by small tappet rods, 7 and 8, which extend into the hollow piston rods of the steam cylinders. As is shown, the valve on one side controls the supply of steam to the opposite side. The air valves are simple check valves, *which seat by gravity while the pistons wait*, and, therefore, are not liable to pound themselves to pieces. (The pistons of one side rest while the pistons of the other side are in motion.) The operation is as follows:

In the position shown, the air piston in cylinder 4 has completed its downward stroke, and compressed its contents through valve 12 into cylinder 3. The plate 20, on steam piston 21, has moved valve 6 to its lowest position. *This admits steam through port* 23, 24, 25 *to upper side of piston* 22, and will cause that piston to descend and expel the partially compressed air in cylinder 3, through valve 14 and passage shown, into the reservoir. Meanwhile, the cylinder 4 has become filled *above* the piston with air at atmospheric pressure through valve 9, and the cylinder 3 will be filled with air at atmospheric pressure through valves 9 and 11, both of which open inward, and are seated by gravity. When piston 22 reaches the end of its downward stroke, the plate 20 strikes the tappet on valve stem 7 and moves valve 5 to its lowest position, thus uncovering port 26 and *admitting steam to the lower side of piston* 21, causing piston 21 to rise and compress the air which is in cylinder 4, through valve 11 into upper part of cylinder 3. Just as piston 21 completes its stroke, its plate 20 strikes the tappet on valve stem 8 and moves valve 6 to its highest position. uncovering port 27 and *admitting steam to the lower side of piston* 22, causing that piston to rise and expel the partially compressed air in cylinder 3, through valve 13 into passage shown. and thence into the reservoir. While the pistons are compressing the air above them into the reservoir, the air cylinders below the pistons will be filled with air at atmospheric pressure through valves 10 and 12, ready for another cycle of operation.

Comparison of Efficiency.

The "*8-inch Pump*" has 1 Steam Cylinder 8 in. dia., 50 in. area; 1 Air Cylinder 7½ in. dia., 44 in. area.

As the pistons are connected to the same piston rod, it requires 50 cu. in. of steam to pump 44 cu. in. of air, or 100 cu. in. of steam to pump 88 cu. in. of air.

The *N. Y. Duplex Pump* has 2 Steam Cylinders 5 in. dia., or a combined area of 39 in.; 1 Air Cylinder 5 in. dia; 1 Air Cylinder 7 in. dia.; or a combined area of 58 in.

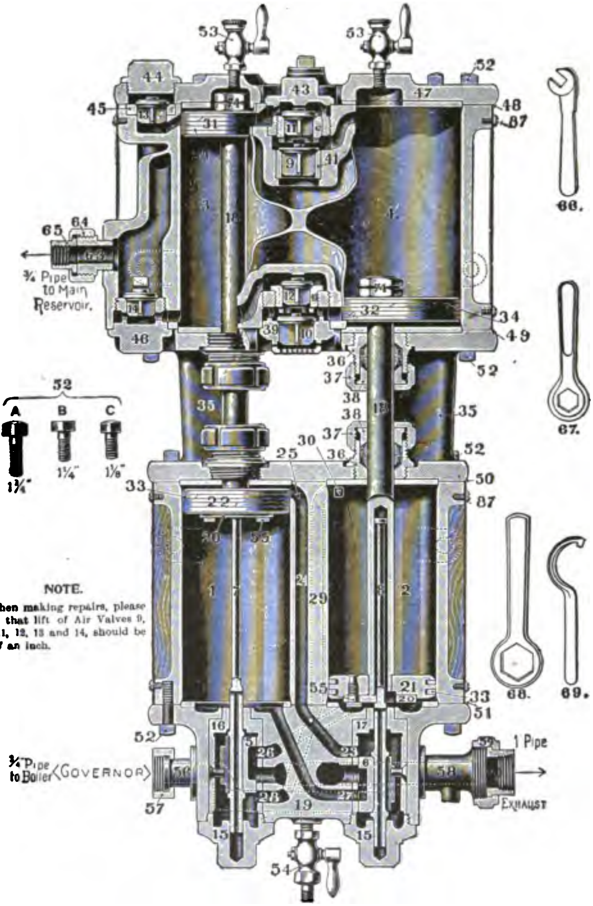
It therefore requires 39 cu. in. of steam to pump 58 cu. in. of air, or 100 cu in. of steam to pump 148 cu. in. of air.

As 100 cu. in. of steam will, in the "Eight Inch" Pump, deliver 88 cu. in. of air, and in the N. Y. Duplex Pump will deliver 148 cu. in. of air, the ratio of efficiency will be as 88 to 148, or 1.00 to 1.67. That is, for the same steam, the N. Y. Duplex Pump will deliver 67 per cent. more air.

NOTE.—As the Duplex Pump is proportioned to use steam at locomotive pressures, time tests should not be made with less than 100 lbs. of steam. The economy of steam appears as well with lower steam pressures, but the excessive amount of steam used by the "Eight-Inch" Pump enables it to run faster than the Duplex at low pressures.

No. 1 Duplex Air Pump.

PLATE Q 2.



NOTE.

When making repairs, please note that lift of Air Valves 9, 10, 11, 12, 13 and 14, should be 1/16 of an inch.

Steam and Exhaust openings are now provided on both sides of the pump, so that it can be placed on either the right or left side of the locomotive, by simply changing plugs. It is arranged for the right hand side, unless otherwise specified.

Parts of No. 1 Duplex Air Pump.

PLATE Q 2.

No.

1–2 Steam Cylinders.

3–4 Air Cylinders.

5-6 Slide Valves (2 pieces).

7–8 Valve Stems (2 pieces).

9–10 Receiving Air Valves (2 pieces).

11–12–13–14 Discharge Air Valves (4 pieces).

15 Steam Chest Caps (2 pieces).

16–17 Steam Chest Bushings. (Specify "right" or "left.")

18 Piston Rods (2 pieces) (includes 1 each of Nos. 20–21, and 2 each of Nos. 33–55–74).

19 Steam Head (includes Nos. 5–6, 16–17, and 2 of No. 15).

20 Tappet Plates (2 pieces).

21-22 Five-inch Steam Pistons (includes 1 each of Nos. 18–20, and 2 each of Nos. 33–55–74).

31 Five inch Air Piston (includes 2 of No. 33).

32 Seven-inch Air Piston (includes 2 of No. 34).

33 Five-inch Piston Rings (6 pieces).

34 Seven-inch Piston Rings (2 pieces).

35 Centre Piece (includes 4 of No. 36).

36 Stuffing Boxes (4 pieces).

37 Stuffing Box Nuts (4 pieces).

38 Stuffing Box Glands (4 pieces).

39 Lower Receiving Valve Chamber.

40 Lower Intermediate Valve Seat.

No.

41 Upper Receiving Valve Seat.

42 Upper Intermediate Valve Seat.

43 Upper Intermediate Valve Chamber.

44 Upper Discharge Valve Cap.

45 Upper Discharge Valve Seat.

46 Lower Discharge Valve Seat.

47 Top Head.

48 Upper Air Cylinder Gasket.

49 Lower Air Cylinder Gasket.

50 Upper Steam Cylinder Gasket.

51 Lower Steam Cylinder Gasket.

52 Cylinder Head Bolts. (Specify length wanted, A–B or C.) (48 pieces.)

53 Oil Cups (2 pieces).

54 Drain Cock.

55 Tappet Plate Bolt (4 pieces).

56 Governor Union Stud.

57 Governor Union Nut.

58 Exhaust Union Stud.

59 Exhaust Union Nut.

60 Exhaust Union Swivel.

63 Air Union Stud.

64 Air Union Nut.

65 Air Union Swivel.

66 Cylinder Head Bolt Wrench.

67 Cap Wrench.

68 Valve Chamber Wrench.

69 Packing Nut Wrench.

74 Piston Rod Nut.

87 Jacket Screws.

Engineer's Brake Valve.

Positive Discharge, with Feed Valve and Supplementary Reservoir.

Vaughan-McKee Patent.

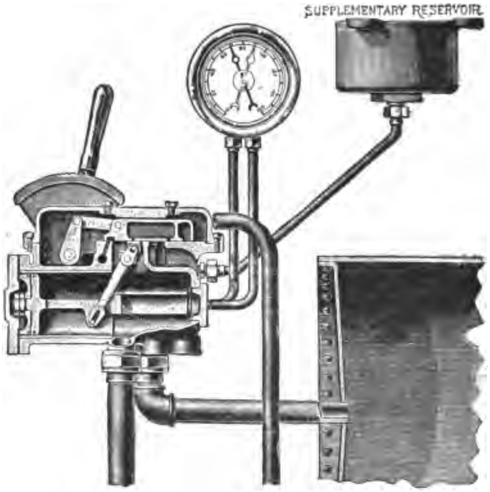


Plate Q 3 shows the construction. Figs. 1 and 2 are external views: rear end and side, respectively. Fig. 3 is a cross section through the feed valve (rear view). Fig. 4 is a section through the side, showing travel of slide valve 114 and how graduating valve 110 is controlled by piston 104. Fig. 5 is a cross section through the slide valve (front view). Fig. 6 is a plan of the valve seat. Fig. 7 shows the face of the slide valve. Fig. 10 shows the supplementary reservoir.

The Principal Parts and their Duties.

Referring to Fig. 4, the chamber **B** is connected to the Main Reservoir. The chamber **A** is connected to the Train Pipe. Discharge of train pipe air to the atmosphere for service application, occurs through ports **F**, **G**, and passage **C**. Main slide valve 114 controls the flow of air from the main reservoir to the train pipe, and from the train pipe to the atmosphere. In the drawing, the slide valve occupies "Running Position." To "release," it moves to the extreme left. To "apply," it moves to the right; a service application uncovering small ports **F** and **G**; an emergency application uncovering the large ports **K** and **J**. (See Figs. 5 and 7.)

Small slide valve 110 is a cut-off or graduating valve, operated by piston 104. It stops the discharge of air to the atmosphere when the train pipe pressure has fallen to the desired amount.

Piston 104 is exposed on one side to train pipe pressure in chamber **A**, and on the other side to pressure from a small supplementary reservoir (connected to space **D**), and causes valve 110 to automatically move whatever distance is necessary to close port **F**. Decrease of train pipe pressure in chamber **A** allows the pressure in the supplementary reservoir to expand, and thus move piston 104 to the left, which, through the agency of lever 112, causes valve 110 to close port **F** by moving as far to the right as port **F** has been carried by slide valve 114. If the slide valve has moved only a short distance, piston 104 will have to move but a short distance to close port **F**, and, consequently, only a slight reduction of train pipe pressure will occur. If the slide valve carries port **F** a considerable distance, then piston 104 must move a considerable distance to close it, and a corresponding reduction of train pipe pressure occurs. Thus, the discharge of train pipe air is greater or less, according to the distance which cut-off valve 110 is required to travel.

Port **H** (Fig 6) connects with a passage running lengthwise of the valve (Figs. 1, 3, and 5), one end of which leads to the supplementary reservoir (as shown by Fig. 2), while the other end leads to the space **D**, back of piston 104 (Figs. 1 and 4). In "Running Position," port **J**, in the *face* of slide valve 114 (Figs. 5 and 7), connects chamber **A** with port **H** in the *seat* of the slide valve (Fig. 6), thus permitting train pipe air to flow into the supplementary reservoir and to the rear of piston, as shown. When the handle is moved to apply brakes, however, ports **J** and **H** no longer connect, and, therefore, the stored up air in the reservoir acts as an independent force on piston 104.

THE OPERATION: With handle in "Running Position," the valves occupy the position shown in Fig. 4. Discharge ports **F** and **G** and **K** are closed, and direct communication from the main reservoir to the train pipe is cut off by the slide valve. By means of the **Feed Valve** described below, however, the train pipe will continue to receive air, through small ports **E** and **M**, until the normal pressure of 70 pounds has been obtained therein.

For "Service" Application, place the handle in one of the "service" or "graduating" notches and *leave it there.* This carries slide valve 114 far enough to the right to uncover small ports F and G, thus permitting train pipe air to escape from chamber **A** to the atmosphere, through the exhaust passage **C.** Small cut-off valve 110 automatically stops the discharge as soon as the train pipe pressure in chamber **A** reduces enough to allow piston 104 to move, as previously explained. For light applications, use the first of the graduating notches on short trains, or the second notch with five or more cars. For heavier applications, move the handle one or two notches further. *See "Running Position" below.*

For an "Emergency" Application, quickly move the handle to position marked "emergency." This will carry slide valve 114 to the extreme right, permitting rapid discharge of train pipe air from chamber **A** and passage **C** to the atmosphere, through ports J (Figs. 5 and 7), the passage in slide valve, and the large port K (Figs. 4 and 7).

With Handle in Position of "Quick Release," slide valve 114 is moved to the extreme left, thus admitting main reservoir pressure direct from chamber **B** to train pipe chamber **A,** through the large opening which the end of the slide valve uncovers. At the same time, air contained in the supplementary reservoir is discharged to the atmosphere through passage H, port J, and passage **C,** thus allowing train pipe pressure to return piston 104 and cut-off valve 110 to the position shown in Fig. 4, in readiness for another service application. *When releasing brakes, always place the handle in "Quick Release" position long enough to permit discharge of air from the supplementary reservoir, before moving the handle back to the "Running" position.*

With the Handle in "Running Position," the supplementary reservoir is charged to the same pressure as the train pipe. If the handle, when in "full release" position, is moved to a service notch too quickly, a full service application will result, but if it is moved slowly, or stopped in either "running" or "lap" position for a second or two, the supplementary reservoir will become charged and automatically cut off the exhaust as usual.

With the Handle in "Lap Position," all communication is cut off between the main reservoir and the train pipe; also, between train pipe and the atmosphere.

THE PUMP GOVERNOR is connected to the passage in which the well known excess pressure valve or **feed valve** is located. (Figs. 3, 5. and 6.) This passage has a port E in the valve seat, which, by movements of the slide valve, is connected either with the main reservoir, with the train pipe, or is closed entirely. The governor is set at 70 lbs. With the engineer's valve handle in Full Release position, it stops the pump when both train pipe and main reservoir show 70 lbs With handle in Running Position, the pump is not stopped until the main reservoir contains the usual excess pressure of 15 or 20 lbs. With handle in Lap Position, or one of the Application Positions, the governor does not allow the main reservoir pressure to exceed the normal amount of 85 or 90 lbs. The pump cannot, therefore, produce undue pressure whether the brakes are set, or released. When the handle is in running position, air from the main reservoir must pass through the feed valve, port *x* (Figs. 4 and 6) and recess *m* in the slide valve (Fig. 7), in order to reach the train pipe.

The Supplementary Reservoir furnished with this valve can be placed in any convenient position, but we advise attaching it to a bracket near the roof of the cab, and connecting the pipe between the reservoir and the Engineer's Valve so that water cannot accumulate in the reservoir, but will drain out of it through the Engineer's Valve. Copper pipe must be used for this purpose, as it can be readily bent into place, and lessens the danger of leakage by avoiding the elbows and joints that are necessary with iron pipe. *All piping must be absolutely tight.*

Remarks: Do not allow the seat of the main slide valve to become dry. If the handle pulls too hard, remove oil plugs 96 (first letting air out of the main reservoir) and oil the seat both in front and back of the slide valve. Before putting back the oil plugs, move the handle back and forth several times to spread the oil over the seat. It is also a good plan to occasionally remove cover 115 and lubricate slide valve 114, and its seat. A good lubricant for this purpose is composed of 1 part beeswax, 1 part tallow, and 3 parts valve oil. Kent's Compound may also be used. The lever shaft 120 should be oiled occasionally, through the oil hole made for that purpose in the flange of the cover, back of the quadrant.

If the Valve does not cut off properly in service applications, examine back head gasket, the piping to supplementary reservoir, and the reservoir itself, for leaks.

Positive Discharge

Engineer's Brake Valve.

PLATE Q 3.

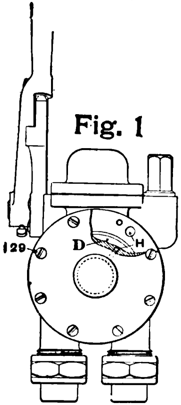


Fig. 1

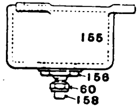


Fig. 10

FACE OF SLIDE VALVE

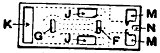


Fig. 7

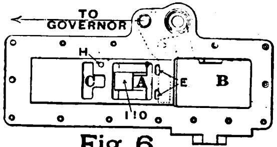


Fig. 6

GAUGE CONNECTION

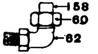


Fig. 8

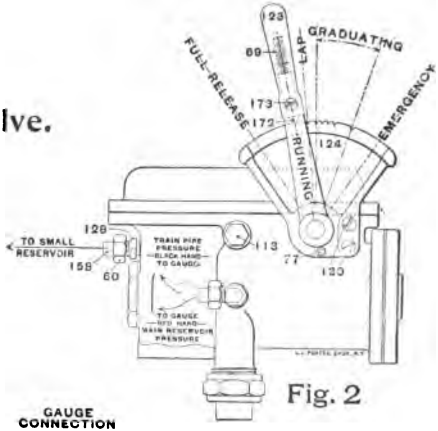


Fig. 2

Fig. 9

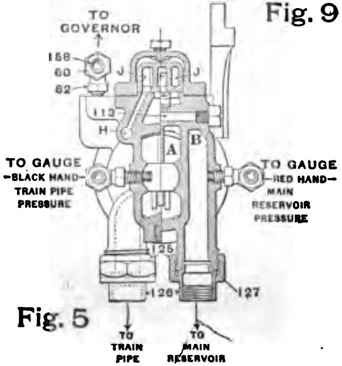

TO GOVERNOR
158
60
62
J
J
113
H
A
B
TO GAUGE —BLACK HAND— TRAIN PIPE PRESSURE
TO GAUGE —RED HAND— MAIN RESERVOIR PRESSURE
125
126
127
TO TRAIN PIPE
TO MAIN RESERVOIR

Fig. 5

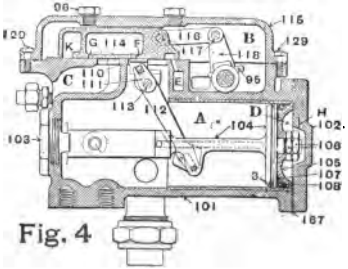


Fig. 4

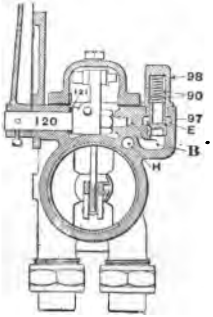


Fig. 3

Parts of
Engineer's Brake Valve.

PLATE Q 3.

No.	
3	Piston Ring.
60	Small Union Nut (5 pieces).
61	Union Swivel for ¼-inch Iron Pipe (see Fig. 9).
62	Gauge and Governor Union Stud (3 pieces).
69	Handle Spring.
77	Handle Set Screw.
90	Feed Valve Spring.
95	Lever Shaft Pin.
96	Oil Plugs (2 pieces).
97	Feed Valve.
98	Feed Valve Cap.
101	Valve Body.
102	Back Cap.
103	End Plug.
104	Piston (includes 1 of No. 3 and 2 of No. 106).
105	Follower.
106	Piston Nut (2 pieces).
107	Packing Leather.
108	Expander.
110	Graduating Valve.
111	Graduating Valve Spring.
112	Graduating Valve Lever.
113	Fulcrum Pin.
114	Main Slide Valve.
115	Valve Cover.
116	Links (2 pieces).
117	Link Pins (2 pieces).
118	Slide Valve Lever.
120	Lever Shaft.
121.	Lever Shaft Packing.
123	Handle.
124	Quadrant.
125	One-inch Union Nut.
126	One-inch Union Swivel.
127	One-inch Union Gasket.
128	Small Union Stud.
129	Cover and Head Screws (23 pieces).
130	Quadrant Screws (2 pieces).
155	Supplementary Reservoir, Fig. 10, (includes Nos. 156–60–158).
156	Reservoir Plug.
158	Union Swivel for ⅜-inch Copper Pipe (5 pieces).
167	Cap Gasket.
172	Quadrant Latch.
173	Latch Pin.

NOTE.—This valve is provided with fittings for ⅜-inch copper pipe, for connections to the Supplementary Reservoir, the Pump Governor, and the Duplex Gauge. When ¼-inch iron pipe is preferred for connections to the Governor and Gauge, the Union Swivel No. 61 may be used instead of Swivel No. 158. **Always use copper pipe for connections to the Supplementary Reservoir, however.**

Plain Triple Valve.

Plate Q 4 shows the Plain Triple Valve, *which is used only on engines and tenders having 8 inch or 10 inch brake cylinders.* The parts are few, simple, and durable, and their operation is not easily affected by dirt.

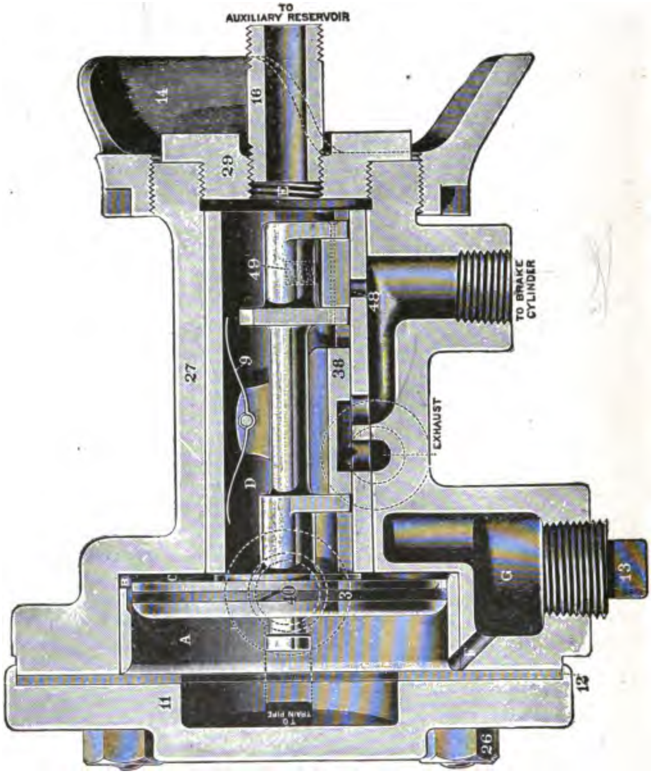
Connections are made with the auxiliary reservoir, the brake cylinder, and the train pipe, as shown; slide valve 38 controls the exhaust of air from brake cylinder, to release brakes, and graduating valve 48 controls the admission of air from auxiliary reservoir to the brake cylinder, for applying brakes. Piston 40 actuates valves 38 and 48 so that valve 38 will close the exhaust port before graduating valve 48 opens the service port. The slide valve 38 can remain stationary while the piston 40 returns part way and causes graduating valve 48 to cover the service port, as the abutments that move valve 38 are farther apart than the length of the valve.

The operation is as follows: Air from the train pipe passes to cylinder A, through charging groove B and passage C to chamber D, and thence through passage E into the auxiliary reservoir. *When the train pipe pressure is reduced,* the piston 40 moves its full stroke, first cutting off the flow of air to auxiliary reservoir, by closing the charging groove B; next causing valve 38 to cover exhaust port, and valve 48 to open the service or graduating port and allow reservoir air to enter the brake cylinder, the quantity admitted being in proportion to the reduction of train pipe pressure. If the train pipe pressure is reduced but little, the pressure in the reservoir is soon reduced to slightly less than that in the train pipe, and the piston 40 starts back and moves graduating valve 48 *without disturbing slide valve* 38, which is held with some force by the air pressure, aided by spring 9, and checks the return stroke when valve 48 has closed the service port. *A further reduction of train pipe pressure* repeats the same action and applies the brakes a little harder. If the train pipe pressure is reduced 5 to 8 pounds, the brakes will be applied with but moderate force, but if the train pipe pressure is reduced 20 pounds, the graduating valve 48 will remain open and the brakes go full on, as the auxiliary reservoir pressure will then continue to flow into the brake cylinder until the pressure in each is equalized.

An increase of pressure in the train pipe will cause all the valves to move back to the position shown in the Plate, thus releasing the brakes and allowing the reservoir to be re charged. Passage F allows moisture from the train pipe to collect into chamber G, where it can be readily drained by unscrewing plug 13.

Plain Triple Valve.

PLATE Q 4.



NOTE.—For use with { **8-inch and 10-inch Driver Brake Cylinders.**
{ **8-inch and 10 inch Tender Brake Cylinders.**

Always use a one-half inch Cut-out Cock (Fig. 8, Plate Q 25) in the branch pipe between this valve and the train pipe, for "Cutting Out" the valve in case of injury to the driver brake or tender brake.

Parts of Plain Triple Valve.

For 8 inch and 10 inch Cylinders Only.

PLATE Q 4.

No.	
3	Piston Ring.
9	Slide Valve Spring.
11	Cap.
12	Gasket.
13	Drain Plug.
14	Bracket.
16	Nipple.
26	Cap Bolt (4 Pieces).
27	Triple Valve Body.
29	Plug.
38	Slide Valve.
40	Piston (includes No. 3).
48	Graduating Valve.
49	Graduating Valve Spring.

"Special"

Driver Brake Triple Valve.

Plate Q 5 shows a Plain triple valve of another style, *which is only used upon engines equipped with brake cylinders of 12-inch and 14-inch diameter.* This valve was specially designed for use with cylinders of such large size and is not intended for any other purpose, or for any other size of cylinder.

The action is similar to the other Plain triple valve shown on Plate Q 4, but the parts are of different construction and are numbered differently. The operation is as follows:—

Slide valve 24 controls the discharge of air from brake cylinder to release brakes, and graduating valve 25 controls the admission of air from the auxiliary reservoir to the brake cylinder for applying brakes. Piston 23 moves both valves, causing valve 24 to close the exhaust port from the brake cylinder *before* the port from graduating valve 25 is opened. The abutments that move valve 24 are farther apart than the length of the valve. This is to allow slide valve 24 to remain stationary, while piston 23 returns far enough to cause graduating valve 25 to close the communicating port between the reservoir and cylinder.

When train pipe pressure is reduced, piston 23 moves downward until its projecting stem strikes the end of stem 26. (Spring 27, which is coiled around the stem 26, prevents further movement of the piston, except as explained below.) This movement of the piston causes valve 24 to close the port leading to the atmosphere, while valve 25 opens the port leading from reservoir to the brake cylinder, as above described. When the reservoir pressure, because of flowing into the empty brake cylinder, is reduced slightly below the pressure left in the train pipe, piston 23 will move upward far enough to cause valve 25 to stop the further use of reservoir air. The piston will not return all the way back to its original position, because slide valve 24 (which is helped by spring 32) offers resistance. In this way, the brakes can be gently applied.

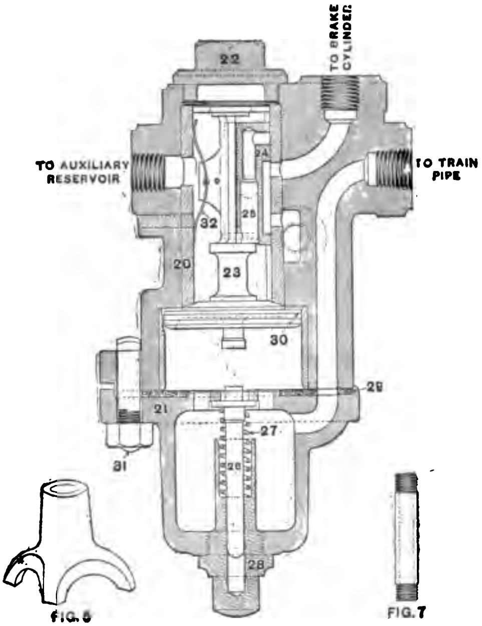
As shown in the description of the engineer's valve, a small reduction of train pipe pressure sets the brakes gently, and a large reduction of train pipe pressure sets them with full force. The small reduction causes the parts to operate as described. The large reduction causes piston 23 to move with such speed and force that it will overcome the resistance of spring 27 and move its entire stroke. This carries both valves 24 and 25 so far downward that reservoir air can flow rapidly through the passage leading to the brake cylinder, thus setting the brakes with their full force.

Increasing the train pipe pressure, will cause the piston and its valves to return to the position shown, thus allowing the auxiliary reservoir to be replenished with air, and allowing the air in the brake cylinder to escape into the atmosphere.

"Special" Driver Brake Triple Valve.

For 12 inch and 14 inch Driver Brake Cylinders.

PLATE Q 6.



NOTE.—This Valve is of special design, and must only be used with 12-inch and 14-inch Driver Brake Cylinders. Always use a one-half inch Cut-out Cock (Fig 8, Plate Q 25) in the branch pipe between this valve and the train pipe, for "Cutting Out" the valve in case of injury to the driver brake parts.

Parts of
"Special" Driver Brake Triple Valve.

For 12 inch and 14 inch Driver Brake Cylinders.

PLATE O 5.

No.
20 Valve Case.
21 Drain Cup.
22 Cap Nut.
23 Piston (includes No. 30).
24 Slide Valve.
25 Graduating Valve.
26 Graduating Stem.

No.
27.*Graduating Spring.
28 Graduating Stem Nut.
29 Gasket.
30 Piston Ring.
31 Bolt and Nut (3 pieces).
32 Slide Valve Spring.

*No. 14 B. W. G. Phosphor Bronze Spring Wire. 13 coils. 3½ inches free height after taking permanent set.

Special Attachments for this Valve only.

Fig. 6. Bracket.
Fig. 7. Nipple.

Quick Action Triple Valve.

Plate Q 6 shows the Quick Action Triple Valve, *which is used upon cars.* The ideal sketch opposite is a more convenient illustration, however, as all working parts are on one plane. In the actual structure, some of the moving parts are at right angles to the main piston, so that all inside parts can be examined, cleaned, or renewed *without detaching the valve from the reservoir or train pipe.* This valve has the same connections and is interchangeable with those in use of another make.

The work it does is known as "service" and "emergency," the first being its ordinary action, and the second giving the very strong and *instant* application for emergency use. To accomplish the latter throughout a long train pressure from the train pipe is discharged at each car *in addition* to the reduction by the engineer. As previously explained, the ordinary service application is made by letting from 6 to 8 lbs. pressure out of train pipe, and the emergency application by a *sudden* reduction of 10 or more pounds. In either case, the reduction causes an impulse of air to travel through the train pipe and operate the triple valve on each car as it passes along. The service reduction is not powerful enough to affect the emergency parts and travels through the train with moderate speed. The emergency reduction, however, is so much more powerful that it *also* sets the emergency parts in motion, and, as they exhaust the train pipe pressure in their immediate vicinity, this impulse is transmitted from car to car with great rapidity.

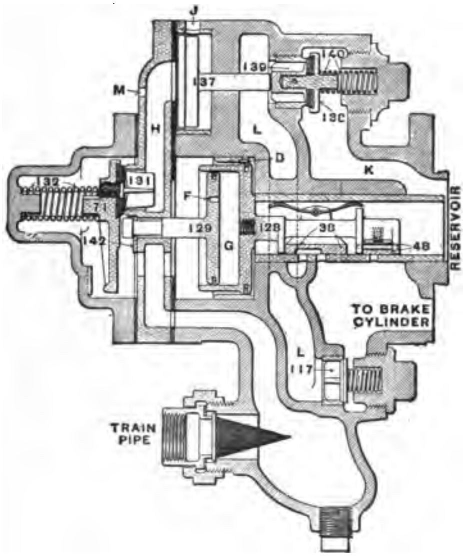
The "service" parts occupy the central portion of the opposite drawing. The auxiliary reservoir is charged through the usual groove B. Exhaust valve 38 and graduating valve 48 cover the usual ports, and are moved by the main piston 128 for applying and releasing the brakes for service stops, in the manner already familiar in plain and quick action triple valves.

The "quick action" parts occupy the left and top portions of the drawing, and are *inoperative under ordinary conditions.* Vent valve 71 is held to its seat by spring 132, assisted by train pipe pressure, and can only be opened when piston 129 is forced to the left. Quick action valve 138–139 is held to its seat by spring 140, assisted by reservoir pressure, and can only be opened when piston 137 moves to the right. All parts are simple and durable, and the valves are so located that oil from the brake cylinder cannot possibly reach a rubber valve seat. The operation is as follows:

Main piston 128 has the same stroke for *both* service and emergency application, but is extended to form a cylinder in which piston 129 is fitted. Through piston 129 is a small opening F, allowing train pipe air to pass through and thus equalize the pressure on both sides. This opening is of such a size that when main piston 128 moves *slowly* to the left, as in *service* applications, the air in space G will be pressed through opening F *without disturbing piston* 129 from the position shown.

The sharp reduction of train pipe pressure for an *emergency* stop will cause main piston 128 to move *rapidly* to the left. In this case, air from space G cannot flow through passage F fast enough to prevent a *momentary* pressure upon piston 129, strong enough to overcome its resistance and cause valve 71 to be pushed from its seat. This allows train pipe air to enter the passage H and escape to the atmosphere through openings J and M, while, at the same time, it forces piston 137 to the right, which unseats valve 139 and allows the *full* power of the reservoir pressure to be *instantly* effective in the brake cylinder through the large passages K and L, and check valve 117.

Meanwhile, *as passage F is always open*, the temporary pressure exerted by the air in chamber G has rapidly lost its effect, and spring 132 has returned valve 71 to its seat, *thus stopping the escape of air when train pipe pressure is sufficiently reduced to properly apply the brakes.* As valve 71 closes, it returns piston 129 to its original position. (It cannot move any farther to the right than is shown in the drawing, as travel in that direction is limited by the stop 142.) Valve 139 and piston 137 have also been returned to their former positions, as shown.

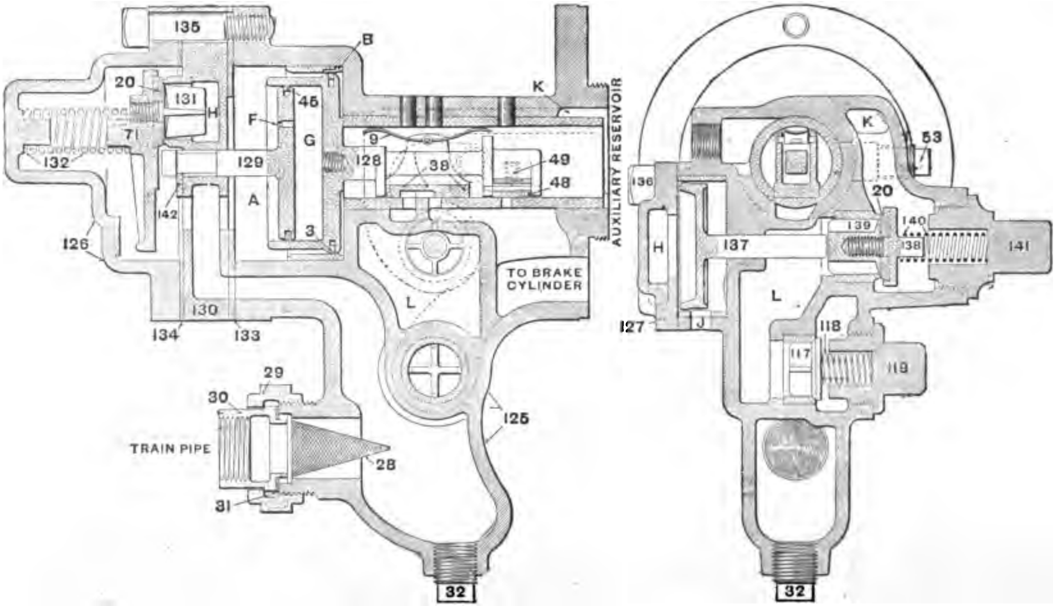


Releasing brakes after an emergency application is prompt and certain. *All other parts having automatically returned to their original positions while the brakes are on*, there is only main piston 128 to be moved. Restoring the train pipe pressure causes it to return valves 38 and 48 to the position shown, allowing the auxiliary reservoir to be replenished and the air to escape from brake cylinder, thus releasing the brakes.

Moisture from train pipe collects in the bottom of the valve, where it can be easily drained by unscrewing the plug provided for that purpose.

Quick Action Triple Valve.

PLATE Q 6.



NOTE :—This valve is made in *two* styles. **Style "F"** for Car Cylinders of **8 Inch** and **6 Inch** diameter. **Style "P"** for Car Cylinders of **10 Inch** diameter, (and, in a few exceptional cases, for Cylinders of other diameters). The valves look alike, but the letter "P" cast upon the outside of that style of valve, enables them to be readily distinguished. Repair parts not exact duplicates are stamped "F" or "P;" parts not so stamped are exactly alike in both valves.

For "Special" Triple Valve, See Plate Q 24.

Parts of Quick Action Triple Valve.

Styles "F" and "P".

PLATE Q 6

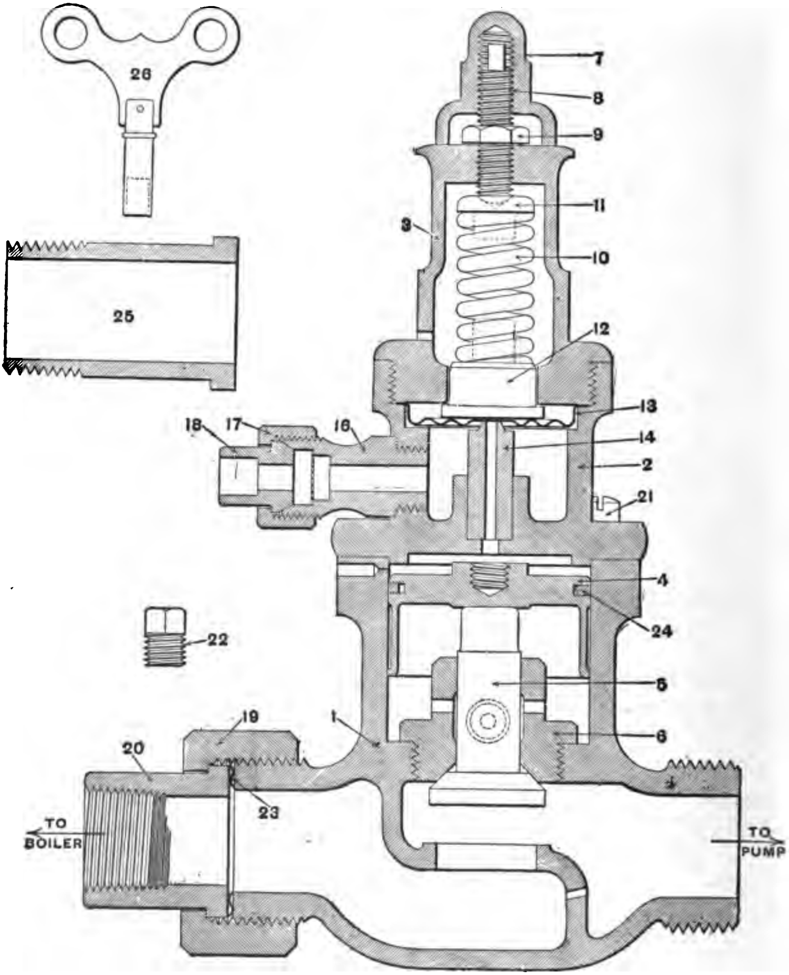
No.	
3	Main Piston Ring.
9	Slide Valve Spring
20	Rubber Valve Seat.
28	Strainer
29	Union Nut.
30	Union Swivel
31	Union Gasket.
32	Drain Plug.
38	Slide Valve.
45	Vent Valve Piston Ring
48	Graduating Valve.
49	Graduating Valve Spring.
53	Exhaust Hole Plug.
71-131-20	Vent Valve, complete.
117	Check Valve.
118	Check Valve Spring
119	Check Valve Cap.

No	
125	Triple Valve Body
126	Front Cap
127	Side Cap
128	Main Piston (includes No. 3).
129	Vent Valve Piston (includes No. 45).
130	Vent Valve Seat.
132	Vent Valve Spring.
133	Main Cylinder Gasket
134	Front Cap Gasket.
135	Front Cap Bolt (3 pieces).
136	Side Cap Bolt (2 pieces).
137	Quick Action Valve Piston.
138-139-20	Quick Action Valve, complete.
140	Quick Action Valve Spring.
141	Quick Action Valve Cap.
142	Piston Stop.
143	Piston Stop Screw (not shown).

For "Special" Triple Valve, See Plate Q 24.

Pump Governor.

PLATE Q 7.



NOTE.—These Governors are furnished in Three Styles.—See "Note" on opposite page.

Pump Governor.

Plate Q 7 shows the construction. It automatically shuts off the supply of steam to the pump when the desired air pressure is obtained in the train pipe and reservoirs, and allows the pump to start again when the air pressure falls below the limit.

Steam valve 5 is opened by steam pressure, but closed by air pressure on top of piston 4 when train pipe pressure has reached the limit for which the governor is adjusted. When the train pipe pressure *underneath* the diaphragm 13, overcomes the tension of spring 10, the diaphragm will rise, and admit train pipe pressure to the top of piston 4, thus forcing valve 5 to descend and shut off the flow of steam. When the train pipe pressure falls below the limit, spring 10 will force the diaphragm to its seat, thus cutting off the supply of air to piston 4. The air *above* piston 4 will then escape through the small vent hole in the body of governor, and allow steam pressure to open the steam valve 5 and reach the pump.

An opening is provided in the chamber under piston 4, for any leakage of steam or air. Any necessary adjustment of the regulating spring 10, may be made by means of screw 8 and lock nut 9. A small hole past the steam valve always admits enough steam to keep the pump from freezing.

Parts of Pump Governor.

PLATE Q 7.

No.	
*1	Steam Valve Body. (Specify Style A or C.)
2	Air Valve Chamber (includes No 16).
3	Spring Casing.
4	Piston (includes No. 24).
5	Steam Valve.
6	Steam Valve Guide.
7	Cap.
8	Adjusting Screw.
9	Jam Nut.
10	Regulating Spring.
11	Upper Spring Washer.
12	Diaphragm Button.
13	Diaphragm.
14	Air Valve Seat.
16	Air Union Stud.
17	Air Union Nut.
18	Air Union Swivel.
*19	Steam Union Nut. (Specify Style A or C.)
*20	Steam Union Swivel. (Specify Style A or C.)
21	Screw (6 pieces).
22	Drain Plug.
*23	Steam Union Gasket. (Specify Style A or C.)
24	Piston Ring.
25	Steam Union Swivel (Style B only).
26	Key.

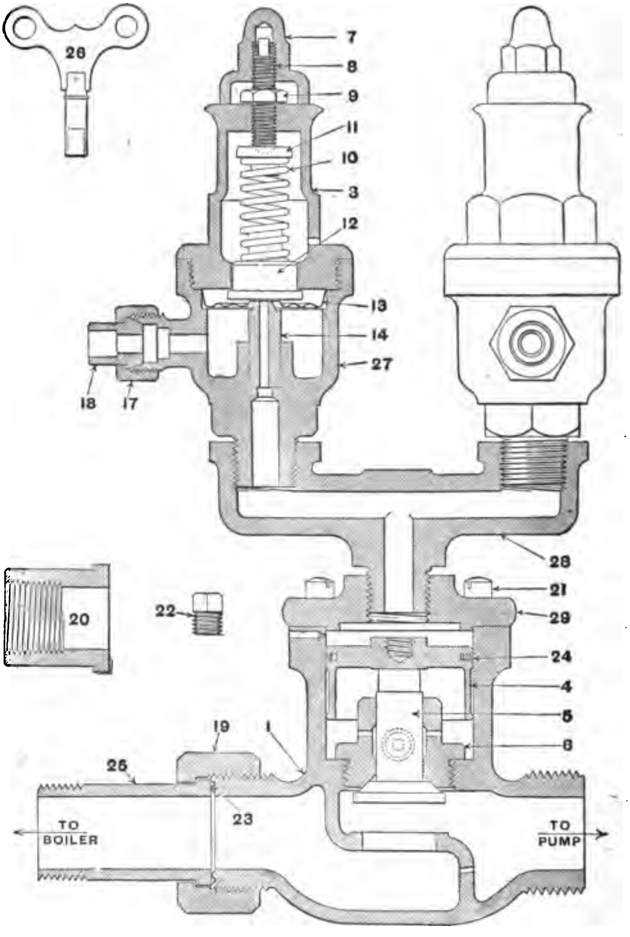
*NOTE.—Pump Governors are furnished in **Three Styles.** Orders for **Complete** Governors, or for **Repair Parts,** Nos. 1, 19, 20, and 23, must always specify **Which Style,** the **Plate,** the **Number,** and **Name** of piece wanted.

STYLE "A." ¾" Governor for New York No. 1 Pump or Westinghouse 6" or 8" Pump.
STYLE "B." 1" Governor for New York No. 3 Pump.
STYLE "C." 1" Governor for Westinghouse 9½" Pump.

"Nos. 1, 19, and 23 are exactly alike for Governors Style A and Style B, and No. 20 is **not used in** Style B Governor, see No. 25."

Duplex Governor.

PLATE Q 8.



NOTE.—These Governors are furnished in **Three Styles.**—See "Note" on opposite page.

Duplex Governor.

Plate Q 8 shows the Duplex Governor, which is used when special conditions of service make it advisable to carry the standard train line pressure of 70 pounds in ordinary service, and a higher pressure when descending long grades with fully loaded trains. It can also be used when it is desirable to control the pump by both train line and main reservoir pressures.

The left hand portion is adjusted to operate at the low or normal train line pressure, and the right hand portion at the high (train line or main reservoir) pressure. When both parts are connected to the train line, a ¼" Cut-out Cock (Fig. 5, Plate Q 34) must be placed in the pipe leading to the low pressure, or left hand, part of the governor This cock must be closed when it is desired to carry the high pressure.

As the operation of this governor is the same as the standard style, Plate Q 7, it is unnecessary to again describe its action. (See page 37.)

Parts of Duplex Governor.

PLATE Q 8.

No.	
*1	Steam Valve Body. (Specify Style A or C.)
3	Spring Casing (2 pieces).
4	Piston (includes No. 24).
5	Steam Valve.
6	Steam Valve Guide.
7	Cap (2 pieces).
8	Adjusting Screw (2 pieces).
9	Jam Nut (2 pieces).
10	Regulating Spring (2 pieces).
11	Upper Spring Washer (2 pieces).
12	Diaphragm Button (2 pieces).
13	Diaphragm (2 pieces).
14	Air Valve Seat (2 pieces).
17	Air Union Nut (2 pieces).
18	Air Union Swivel (2 pieces).
*19	Steam Union Nut. (Specify Style A or C.)
*20	Steam Union Swivel. (Specify Style A or C.)
21	Screw (6 pieces).
22	Drain Plug.
*23	Steam Union Gasket. (Specify Style A or C.)
24	Piston Ring.
25	Steam Union Swivel (Style B only).
26	Key.
27	Diaphragm Body (2 pieces).
28	Siamese Fitting.
29	Cylinder Cap.

*NOTE.—Pump Governors are furnished in **Three Styles**. Orders for **Complete** Governors, or for **Repair Parts**, Nos. 1, 19, 20, and 23, must always specify **Which Style**, the **Plate**, the **Number**, and **Name** of piece wanted.

STYLE "A." ¾" Governor for New York No. 1 Pump or Westinghouse 6" or 8" Pump.
STYLE "B." 1" Governor for New York No. 2 Pump.
STYLE "C." 1" Governor for Westinghouse 9½" Pump.

"Nos. 1, 19, and 23 are exactly alike for Governors Style A and Style B, and No. 20 is not used in Style B Governor, see No. 25."

Details of Brake Apparatus.

FOR LOCOMOTIVE AND TENDER.

PLATE Q 9.

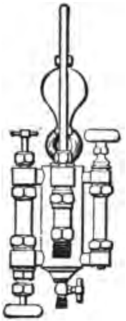


Fig. 1.

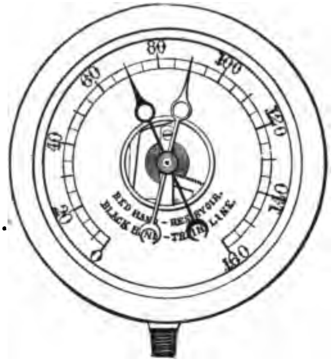


Fig. 2.

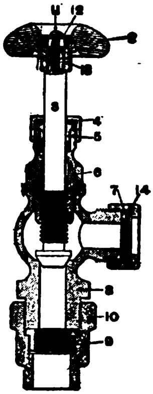


Fig. 3

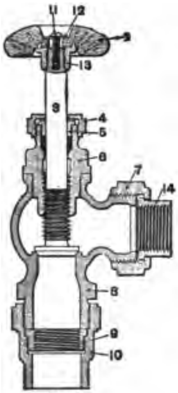


Fig. 4

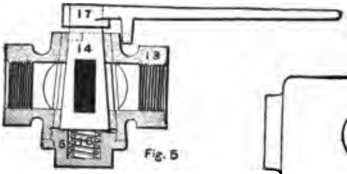


Fig. 5

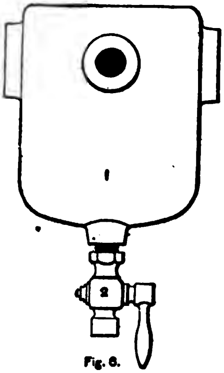


Fig. 6.

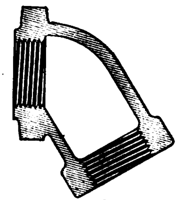


Fig. 12

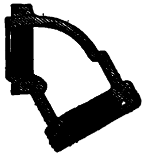


Fig. 8.

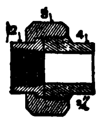


Fig. 9.

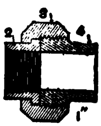


Fig. 10.

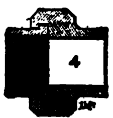


Fig. 11

Details of Brake Apparatus.

FOR LOCOMOTIVE AND TENDER.

PLATE Q 9.

FIG. 1.

Air Pump Lubricator.

FIG. 2.

Duplex Air Gauge.

FIG. 3.

¾ inch Steam Valve Complete. Used with No. 1 Pump

DETAILS.

2 Hand Wheel.
3 Valve Stem.
4 Packing Nut.
5 Packing Gland
6 Neck Piece.
7 Union Nut.
8 Valve Body.
*9 Union Swivel.
*10 Valve Stud
11 Screw.
12 Washer.
13 Socket.
14 Steam-pipe Swivel Ring

FIG. 4.

1 inch Steam Valve Complete. Used with No. 2 Pump.

DETAILS.

2 Hand Wheel.
3 Valve Stem.
4 Packing Nut
5 Packing Gland
6 Neck Piece.
7 Union Nut.
8 Valve Body
*9 Union Swivel.
*10 Valve Stud.
11 Screw.
12 Washer.
13 Socket.
14 Steam-pipe Swivel

* Are not included with new valves unless ordered.

FIG. 5.

1 inch Cut-out Cock Complete.

DETAILS.

13 Body.
14 Plug.
15 Nut.
16 Spring.
17 Handle.

FIG. 6.

Tender Drain Cup Complete.

DETAILS.

1. Tender Drain Cup.
2 Drain Cock.

NOTE.—This is regularly tapped for 1" pipe. It can be tapped for 1¼" pipe, if so specified.

FIG. 8.

1x1¼ inch Angle Fitting

FIG. 9.

¾ inch Reservoir Union Complete.

DETAILS.

2 Union Swivel.
3 Union Nut.
4 Union Stud.

FIG. 10.

1 inch Reservoir Union Complete.

DETAILS.

2 Union Swivel.
3 Union Nut.
4 Union Stud.

FIG. 11.

1¼ inch Reservoir Union Complete.

DETAILS.

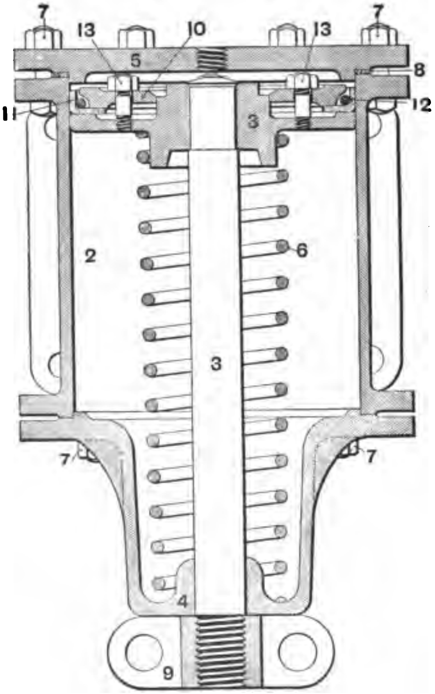
2 Union Swivel.
3 Union Nut.
4 Union Stud.

FIG. 12.

1¼x1¼ inch Angle Fitting

Push Down Driver Brake Cylinder.

PLATE Q 10.



Pull Up Driver Brake Cylinders.

PLATE Q 14.

	OUTER FLANGES FULL.		OUTER FLANGES REMOVED.
	DIA.	STROKE.	
STANDARD SIZES.	6 inches	x 6 inches	Any size will be furnished with outer flanges removed, if ordered that way.
	6 "	x 8 "	
	8 "	x 6 "	
	8 "	x 7 "	
	8 "	x 10 "	
	8 "	x 12 "	
	10 "	x 6 "	
	10 "	x 8 "	
	10 "	x 10 "	
	10 "	x 12 "	
	12 "	x 8 "	
	12 "	x 10 "	
	12 "	x 12 "	
	14 "	x 10 "	
	14 "	x 12 "	

The *outside length* of cylinder body No. 2 is always about 2 *inches more* than the actual stroke given here, as the piston occupies 2 inches.

DETAILS.

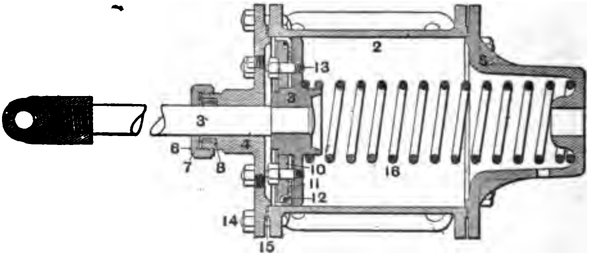
No.
2 Cylinder Body.
3 Piston and Rod (includes No. 13).
4 Stuffing Box Head.
5 Flat Head.
6 Packing Nut.
7 Cup Leather.
8 Packing Spring.

No.
9 Cross Head. (Select style from Plate Q 17.)
10 Follower.
11 Packing Leather.
12 Expander.
13 Follower Stud and Nut.
14 Cylinder-head Bolt and Nut.
15 Gasket.

TYPE "A"

Pull Driver Brake Cylinder.

PLATE Q 15.



TYPE "A"

Pull Driver Brake Cylinders.

PLATE Q 15.

STANDARD SIZES.

OUTER FLANGES FULL		OUTER FLANGES REMOVED
DIA.	STROKE.	
6 inches x	6 inches	Any size will be furnished with outer flanges removed, if ordered that way.
6 '' x	8 ''	
8 '' x	6 ''	
8 '' x	7 ''	
8 '' x	10 ''	
8 '' x	12 ''	
10 '' x	6 ''	
10 '' x	8 ''	
10 '' x	10 ''	
10 '' x	12 ''	
12 '' x	8 ''	
12 '' x	10 ''	
12 '' x	12 ''	
14 '' x	10 ''	
14 '' x	12 ''	

The *outside length* of cylinder body No. 2 is always about 2 *inches more* than the actual stroke given here, as the piston occupies 2 inches.

DETAILS.

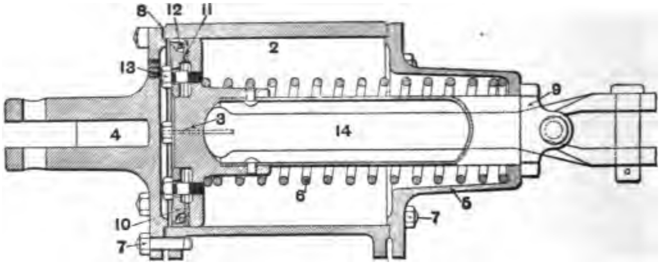
No.
2 Cylinder Body.
3 Piston and Rod (includes No. 13).
4 Stuffing Box Head.
5 Back Head.
6 Packing Nut.
7 Cup Leather.
8 Packing Spring.
9 Cross Head. (Select style from Plate Q 17.)

No.
10 Follower.
11 Packing Leather.
12 Expander.
13 Follower Stud and Nut.
14 Cylinder-head Bolt and Nut.
15 Gasket
16 Release Spring.

TYPE "D"

Engine Truck Brake Cylinder.

PLATE Q 16.



NOTE:—The flexible hose for connecting this cylinder with the pipe leading to the Triple Valve, is shown on Plate Q 34.

TYPE "D"

Engine Truck Brake Cylinders.

PLATE Q 16.

STANDARD SIZES.

DIA.		STROKE.
6 inches	x	6 inches
6 "	x	8 "
8 "	x	7 "
8 "	x	12 "
10 "	x	8 "
10 "	x	10 "
10 "	x	12 "

The *outside length* of cylinder body No 2 is always about 2 *inches more* than the actual stroke given here, as the piston occupies 2 inches.

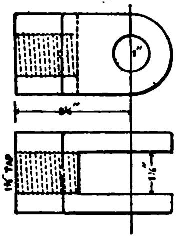
DETAILS.

No.	
2	Cylinder Body.
3	Piston and Rod (includes No. 13 only).
4	Forked Head.
5	Back Head.
6	Release Spring.
7	Cylinder-head Bolt and Nut.
8	Gasket.
9	Push-rod Holder.
10	Follower.
11	Packing Leather.
12	Expander.
13	Follower Stud and Nut.
14	Push Rod, complete.
15	Oil Plug (not shown).
16	Push-rod Holder Pin, with Cotter.
17	Push-rod Pin, with Cotter.

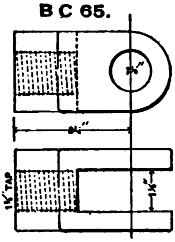
Cross Heads.

PLATE Q 17.

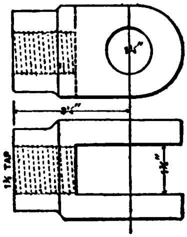
B C 61.



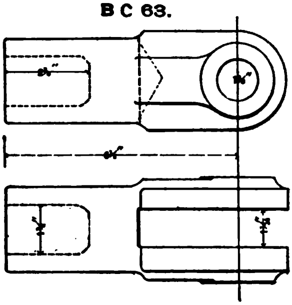
B C 65.



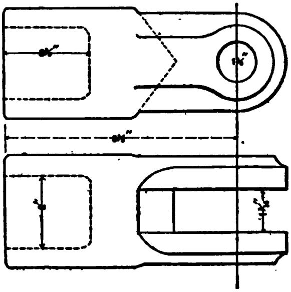
B C 64.



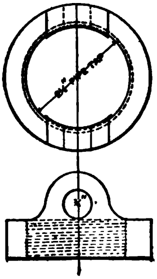
B C 63.



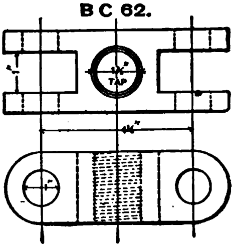
B C 67.



B C 66.



B C 62.



Cross Heads.

PLATE Q 17.

Fig. BC. 61.
Fig. BC. 62.
Fig. BC. 63.
Fig. BC. 64.
Fig. BC. 65.
Fig. BC. 66.
Fig. BC. 67

Reservoirs.

PLATE Q 18.

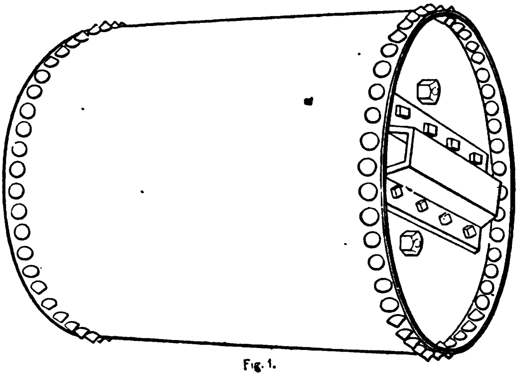


Fig. 1.

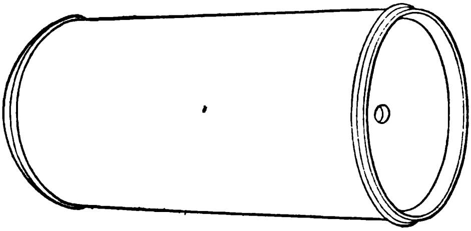


Fig. 2.

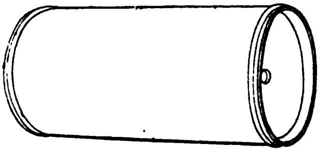


Fig. 5

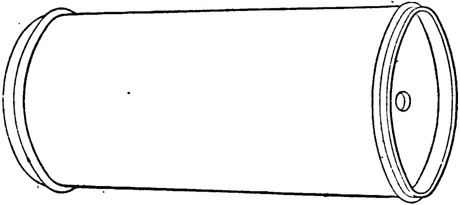


Fig. 3

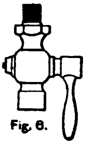


Fig. 6.

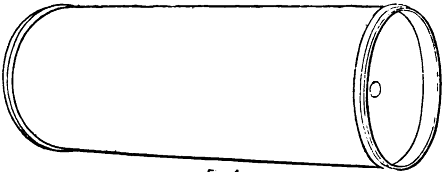


Fig. 4

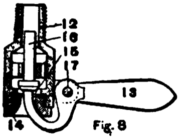


Fig. 8

Reservoirs.

PLATE Q 18.

FIG. 1.
Main Reservoir

16	inches.	x 126	inches,	capacity	about	24,000	cubic inches.
18	"	x 100	"	"	"	24,000	"
20½	"	x 41	"	"	"	12,000	"
20½	"	x 84	"	"	"	25,000	"
22½	"	x 34	"	"	"	11,000	"
22½	"	x 41	"	"	"	14,000	"
24½	"	x 34	"	"	"	14,000	"
24½	"	x 41	"	"	"	17,500	"
26½	"	x 41	"	"	"	20,000	"
26½	"	x 96	"	"	"	50,000	"

NOTE.—Main Reservoir capacity for Passenger Engines should not be less than 16,000 cubic inches, and for Freight Engines 20,000 to 50,000, according to the number of air brake cars to be handled.

FIG. 2.

16 inch by 33 inch Auxiliary Reservoir. (For use with 14-inch brake cylinders.)

FIG. 3.

14 inch by 33 inch Auxiliary Reservoir. (For use with 12 inch brake cylinders.)

FIG. 4.

12 inch by 33 inch Auxiliary Reservoir. (For use with 10 inch brake cylinders.)

FIG. 5.

10 inch by 24 inch Auxiliary Reservoir. (For use with 8 inch Tender and Truck brake cylinders.)

FIG. 6.

Reservoir Drain Cock.

FIG. 7.

Automatic Drain Cock. (For main reservoir only. For details of this cock, see Plate Q 34, Fig. 7.)

FIG. 8.

10 inch by 33 inch Auxiliary Reservoir. (For use with 8 inch Driver brake cylinders.)

FIG. 9.

16 inch by 42 inch Auxiliary Reservoir. (For use with 16 inch Driver brake cylinders.)

Tender Cylinders.

PLATE Q 19.

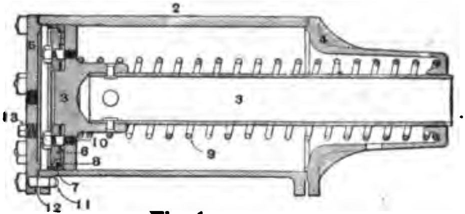


Fig. 1

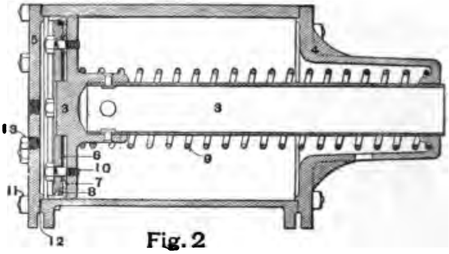


Fig. 2

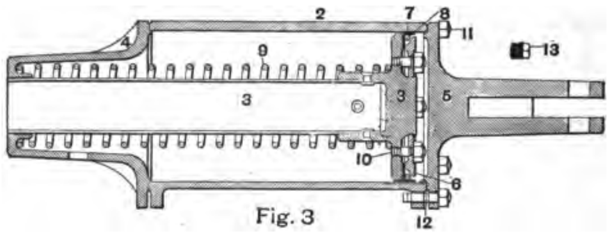


Fig. 3

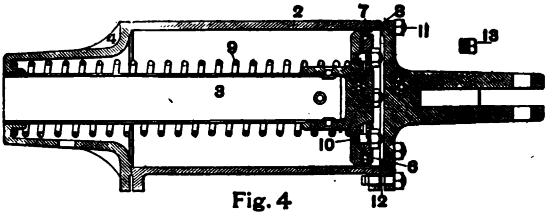


Fig. 4

NOTE.—If, when empty, the Tender weighs 32,000 lbs. or less, use the 8 inch Tender Cylinder and a 10 inch by 24 inch Auxiliary Reservoir. On all Tenders *above* that weight use the 10 inch Tender Cylinder and 12 inch by 33 inch Auxiliary Reservoir. Tenders should have a braking power equal to 90 % of their empty weight.

Tender Cylinders.

PLATE Q 19.

FIG. 1.

Eight-inch Flat Head Tender Cylinder, complete.

FIG. 2.

Ten-inch Flat Head Tender Cylinder, complete.

DETAILS.

No.
2 Cylinder Body.
3 Piston and Rod (includes No. 10).
4 Back Head.
5 Flat Head.
6 Follower.
7 Packing Leather.

No.
8 Expander.
9 Release Spring.
10 Follower Stud and Nut.
11 Cylinder-head Bolt and Nut.
12 Gasket.
13 Plug.

FIG. 3.

Eight-inch Forked Head Tender Cylinder, complete.

FIG. 4.

Ten-inch Forked Head Tender Cylinder, complete.

DETAILS.

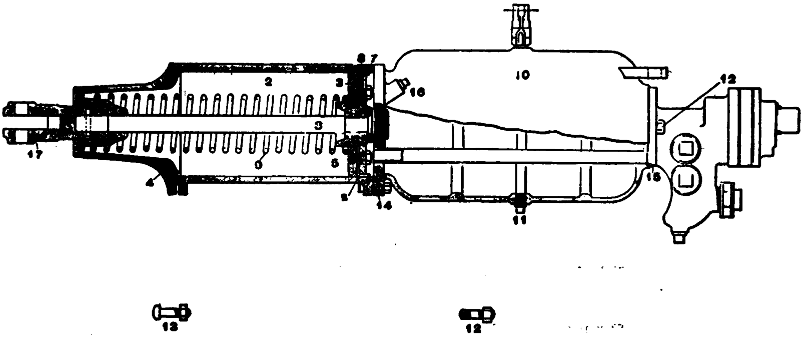
No.
2 Cylinder Body.
3 Piston and Rod (includes No. 10).
4 Back Head.
5 Forked Head. (Specify length wanted.)
6 Follower.
7 Packing Leather.

No.
8 Expander.
9 Release Spring.
10 Follower Stud and Nut.
11 Cylinder-head Bolt and Nut.
12 Gasket.
13 Plug.

"Special" 8 inch Passenger Car Apparatus.

For Narrow Gauge and Small Passenger Cars, weighing less than 82,000 lbs., when empty, provided the total brake power amounts to 90% of the car weight, and is equally distributed to every wheel

PLATE Q 20.



Note:—With this apparatus, the style "P" Triple Valve, Plate Q 6, should be used.

"Special" 8 inch Passenger Car Apparatus.

PLATE Q 20.

No. 1. "Special" Car Cylinder, Reservoir and Triple Valve, complete.

DETAILS.

No.
2 Cylinder Body.
3 Piston and Rod (includes No. 5).
4 Back Head.
5 Follower Stud and Nut.
6 Follower.
7 Packing Leather.
8 Expander.
9 Release Spring.

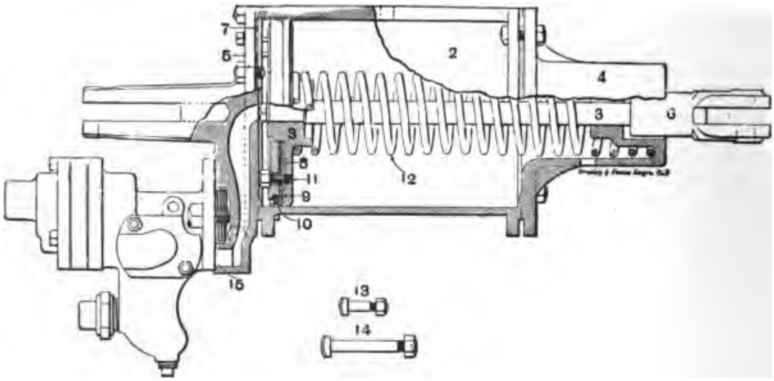
No.
10 Reservoir (includes Nos. 11, 12, and 16).
11 Drain Plug.
12 Reservoir Stud and Nut.
13 Cylinder-head Bolt and Nut.
14 Cylinder Gasket.
15 Triple Valve Gasket.
16 Oil Plug.
17 Cross Head.

For Triple Valve, see Plate Q 6, Style "P."

Ten Inch Car Cylinder.

For Cars weighing, when empty, 32,000 to 50,000 lbs., provided the total brake power amounts to 90% of the car weight, and is equally distributed to every wheel.

PLATE Q 21.



Note:—The style "P" Triple Valve, Plate Q 6, must be used with this cylinder.

Ten Inch Car Cylinder.

PLATE Q 21.

No. 1. Ten inch Car Cylinder, complete.

DETAILS.

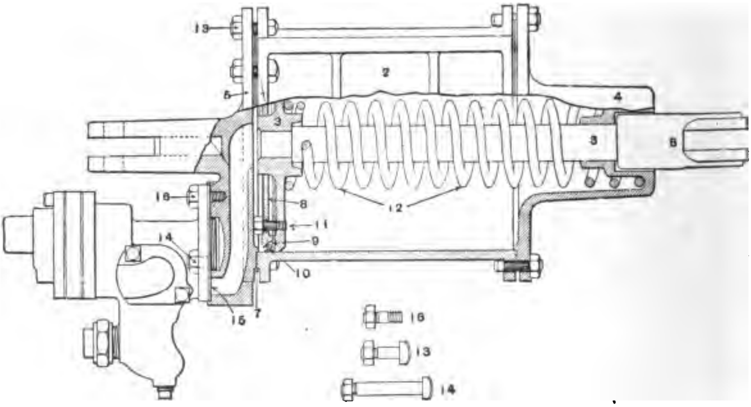
No.	
2	Cylinder Body.
3	Piston and Rod (includes No. 11).
4	Back Head.
5	Forked Head (includes 2 of No. 14).
6	Cross Head.
7	Gasket.
8	Follower.
9	Packing Leather.
10	Expander.
11	Follower Stud and Nut.
12	Release Spring.
13	Cylinder-head Bolt and Nut.
14.	Triple-valve Bolt and Nut.
15	Triple-valve Gasket.

For Triple Valve, see Plate Q 6, Style " P."

Twelve Inch Car Cylinder.

For cars weighing, when empty, over 50,000 and not more than 70,000 lbs. provided the total brake power amounts to 90% of the car weight, and is equally distributed to every wheel.

PLATE Q 22.



NOTE.—The "Special" Triple Valve, Plate Q 24, must be used with this cylinder.

Twelve Inch Car Cylinder.

PLATE Q 22.

No. 1. Twelve Inch Car Cylinder, complete.

DETAILS.

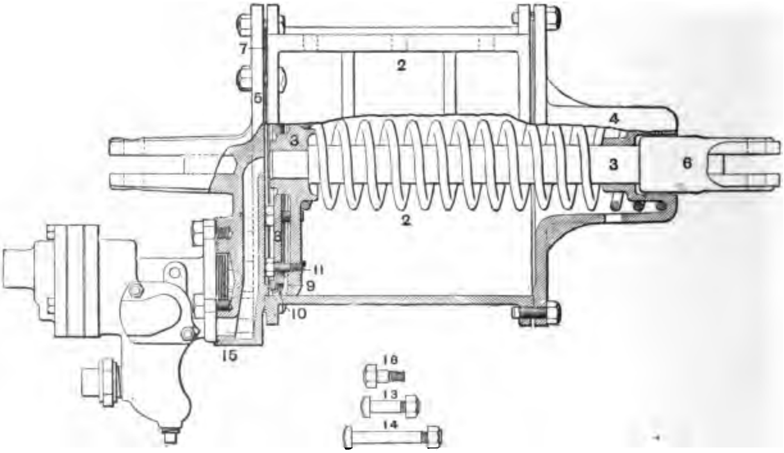
No.		No.	
2	Cylinder Body.	9	Packing Leather.
3	Piston and Rod (includes No. 11).	10	Expander.
4	Back Head.	11	Follower Stud and Nut.
5	Forked Head (includes No. 16 and 2 of No. 14).	12	Release Spring.
6	Cross Head.	13	Cylinder-head Bolt and Nut.,
7	Gasket.	14	Triple-valve Bolt and Nut.
8	Follower.	15	Triple-valve Gasket.
		16	Triple-valve Stud and Nut.

For Triple Valve, see Plate Q-24.

Fourteen Inch Car Cylinder.

For cars weighing, when empty, over 70,000 lbs., provided the total brake power amounts to 90% of the car weight, and is equally distributed to every wheel.

PLATE Q 23.



NOTE.—The "Special" Triple Valve, Plate Q 24, must be used with this cylinder.

Fourteen Inch Car Cylinder.

PLATE Q 23.

No. 1. Fourteen inch Car Cylinder, complete.

DETAILS.

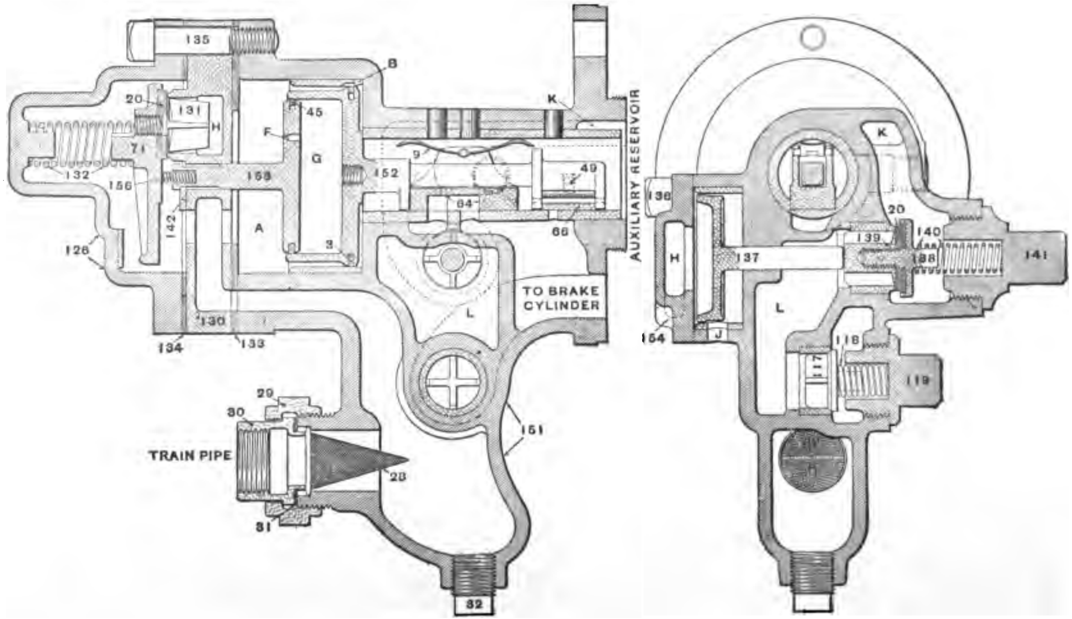
No.
2 Cylinder Body.
3 Piston and Rod (includes No. 11)
4 Back Head.
5 Forked Head (includes No. 16, and 2 of No. 14)
6 Cross Head.
7 Gasket.
8 Follower.

No.
9 Packing Leather.
10 Expander.
11 Follower Stud and Nut.
12 Release Spring.
13 Cylinder-head Bolt and Nut.
14 Triple-valve Bolt and Nut.
15 Triple-valve Gasket.
16 Triple-valve Stud and Nut.

For Triple Valve, see Plate Q. 24.

"Special". Quick-Action Triple Valve.

PLATE Q. 24.



IMPORTANT.—The "Special" Triple Valve is for use *only* with the 12 inch and 14 inch Passenger Car Cylinders, and must not be used with smaller cylinders.

Parts of
"Special" Quick-Action Triple Valve.

For 12 inch and 14 inch Car Cylinders.

PLATE Q 24.

No.	
3	Main Piston Ring.
9	Slide Valve Spring.
20	Rubber Valve Seat.
28	Strainer.
29	Union Nut.
30	Union Swivel.
31	Union Gasket.
32	Drain Plug.
45	Vent Valve Piston Ring.
49	Graduating Valve Spring.
64	Slide Valve.
66	Graduating Valve.
71–131–20	Vent Valve, complete.
117	Check Valve.
118	Check Valve Spring.
119	Check Valve Cap.
126	Front Cap.

No.	
130	Vent Valve Seat.
132	Vent Valve Spring.
133.	Main Cylinder Gasket.
134	Front Cap Gasket.
135	Front Cap Bolt (3 pieces).
136	Side Cap Bolt (2 pieces).
137	Quick Action Valve Piston.
138–139–20	Quick Action Valve, complete.
140	Quick Action Valve Spring.
141	Quick Action Valve Cap.
142	Piston Stop.
143	Piston Stop Screw (not shown).
151	Triple Valve Body.
152	Main Piston (includes No. 3).
153	Vent Valve Piston (includes No. 45).
154	Side Cap.
156	Vent Valve Piston Spring.

Details of Passenger Car Brake Apparatus.

PLATE Q 25.

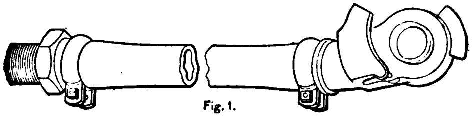


Fig. 1.

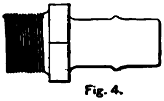


Fig. 4.

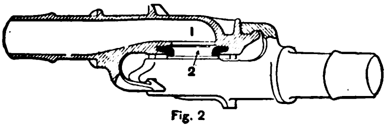


Fig. 2

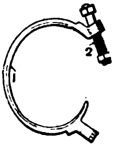


Fig. 5.

Fig. 3.

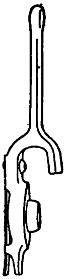


Fig. 6

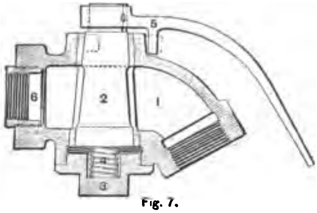


Fig. 7.

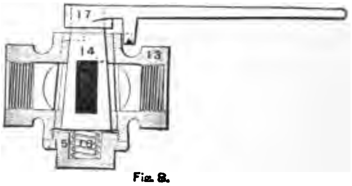


Fig. 8.

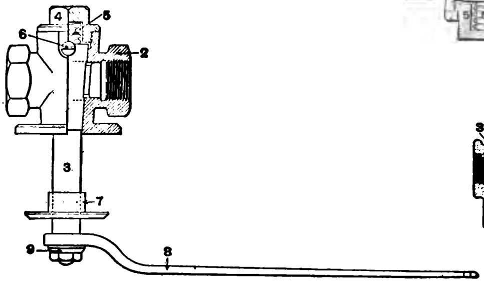


Fig. 9

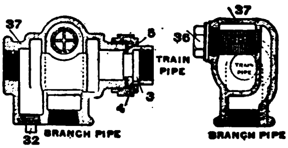


Fig. 10.

Details of Passenger Car Brake Apparatus.

PLATE Q 25.

FIG. 1.

Standard 1 inch Hose and Coupling, complete. (Order in pairs.)

FIG. 2.

No.	
1	Standard 1 inch Coupling. (Order in pairs.)
2	Packing Ring.

FIG. 3.

Standard 1 inch Hose.

FIG. 4.

1 inch by 1¼ inch Hose Nipple.

FIG. 5.

No.	
1	Hose Clamp, 1 inch.
2	Hose-clamp Bolt.

FIG. 6.

1 inch Dummy Coupling.

FIG. 7.

1 inch by 1¼ inch Angle Cock, complete.

No.	DETAILS.
1	Body.
2	Plug.
3	Cap.
4	Spring.
5	Handle.
6	Reducer.

FIG. 8.

1 inch Cut-out Cock, complete.

No.	DETAILS.
13	Body.
14	Plug.
15	Cap.
16	Spring.
17	Handle

FIG. 9.

No. 1. Conductor's Valve, complete.

No.	DETAILS.
2	Body.
3	Plug.
4	Cap.
5	Spring.
6	Stop.
7	Escutcheon.
8	Handle.
9	Nut.

FIG. 10.

No. 1. 1 inch Car Drain Cup, complete.

No.	DETAILS.
37	Body.
3	Union Swivel.
4	Union Nut.
5	Union Gasket.
35	Strainer.
36	Spider.
32	Plug.

Air Signal Apparatus.

PLATE A 3.

FIG. 1.

No. 1. Car Discharge Valve, complete.

No.	DETAILS.
2	Body.
3	Stem.
4	Spring.
5	Handle.
6	Stop Pin.
7	Cap.
8	Union Nut.
9	Union Swivel.
10	Union Gasket.

FIG. 2.

No. 1. Signal Valve, complete.

FIG. 3.

No. 1. Reducing Valve, complete.

No.	DETAILS.
2	Body.
3	Spring Cap.
4	Valve Stud.
5	Supply Valve.
6	Diaphragm Plate.
7	Diaphragm.
8	Diaphragm Nut.
9	Diaphragm Spring.
10	Supply-valve Spring.

FIG. 4.

Signal Whistle, complete.

Details of Signal Apparatus.

PLATE Q 26.

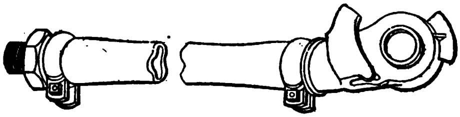


Fig. 1.

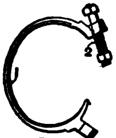


Fig. 4.

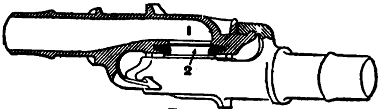


Fig. 2

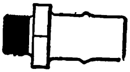


Fig. 5.

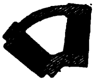


Fig. 6.

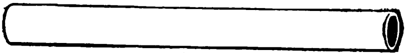


Fig. 3.

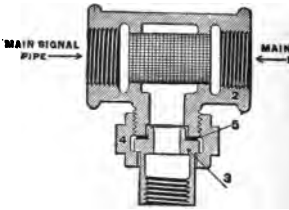


Fig. 7

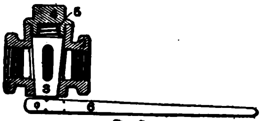


Fig. 8.

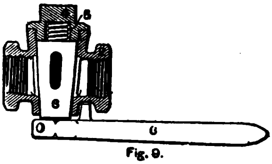


Fig. 9.

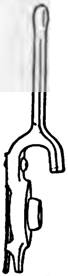


Fig. 10

Details of Signal Apparatus.

PLATE Q 26.

FIG. 1.

Standard Signal Hose and Coupling. complete. (Order in pairs.)

FIG. 2.

No.
1 Signal Coupling, complete. (Order in pairs.)
2 Packing Ring.

FIG. 3.

Standard Signal Hose.

FIG. 4.

No.
1 Hose Clamp.
2 Hose-clamp Bolt.

FIG. 5.

1 inch by ¾ inch Hose Nipple.

FIG. 6.

¾ inch Angle Fitting.

FIG. 7.

No. 1. Signal Pipe Strainer. complete.

DETAILS.

No.
2 Body.
3 Union Swivel.
4 Union Nut.
5 Gasket.

FIG. 8.

No. 1. ½ inch Cut-out Cock, complete.

DETAILS.

No
2 Body
3 Plug.
4 Cap.
5 Spring.
6 Handle.

FIG. 9.

No. 1. ¾ inch Cock, complete.

DETAILS.

No.
2 Body.
3 Plug.
4 Cap.
5 Spring.
6 Handle.

FIG. 10.

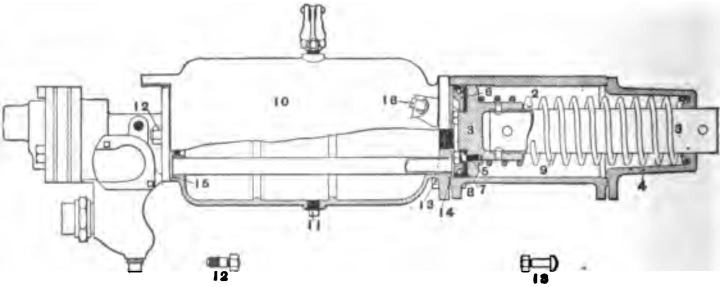
Signal Dummy Coupling.

Narrow Gauge Freight Car Cylinder, Reservoir and Triple Valve.

(6 INCH DIAMETER BY 8 INCH STROKE.)

For cars weighing, when empty, 15,000 lbs. or less, provided the total brake power amounts to 70% of the car weight, and is equally distributed to every wheel.

PLATE Q 27.



NOTE.—The Style "F" Triple Valve, Plate Q 6, must be used for this apparatus.

Narrow Gauge Freight Car Cylinder, Reservoir and Triple Valve.

(6 INCH DIAMETER BY 8 INCH STROKE.)

PLATE Q 27.

No. 1. Narrow Gauge Car Cylinder, Reservoir and Triple Valve, complete.

DETAILS.

No.	
2	Cylinder Body.
3	Piston and Rod (includes No. 5).
4	Back Head.
5	Follower Stud and Nut.
6	Follower.
7	Packing Leather.
8	Expander.
9	Release Spring.

No.	
10	Reservoir (includes Nos. 11–12 and 16).
11	Drain Plug.
12	Reservoir Stud and Nut.
13	Cylinder-head Bolt and Nut.
14	Cylinder Gasket.
15	Triple-valve Gasket.
16	Oil Plug.

For Triple Valve, see Plate Q 6, Style F2

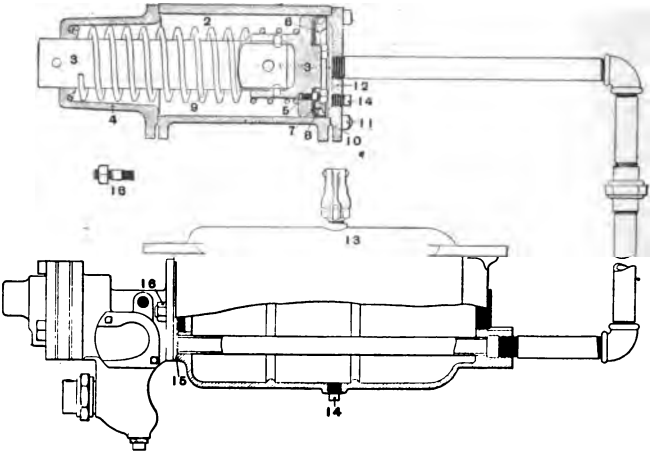
"Special" Narrow Gauge Freight Car Cylinder,

with Detached Auxiliary Reservoir and Triple Valve.

(6 INCH DIAMETER BY 8 INCH STROKE.)

For cars weighing, when empty, 13,000 lbs. or less, provided the total brake power amounts to 70% of the car weight, and is equally distributed to every wheel.

PLATE Q 28.



NOTE.—The Style "F" Triple Valve, Plate Q 6, must be used for this apparatus.

"Special" Narrow Gauge Freight Car Cylinder,

with Detached Auxiliary Reservoir and Triple Valve.

(6 INCH DIAMETER BY 8 INCH STROKE.)

PLATE Q 28.

"Special" Narrow Gauge Car Cylinder, with Detached Auxiliary Reservoir and Triple Valve, complete.

DETAILS.

No.		No.	
1	Brake Cylinder, complete.	10	Gasket.
2	Cylinder Body.	11	Cylinder-head Bolt and Nut.
3	Piston and Rod (includes No. 5).	12	Flat Head.
4	Back Head.	13	Special Auxiliary Reservoir (includes Nos. 14 and 16).
5	Follower Stud and Nut.	14	Drain Plug.
6	Follower.	15	Triple-valve Gasket.
7	Packing Leather.	16	Reservoir Stud and Nut.
8	Expander.		
9	Release Spring.		

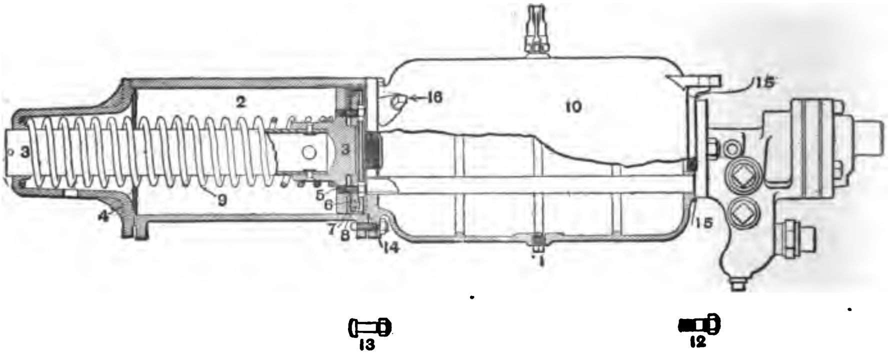
For Triple Valve, see Plate Q 6, Style "F."

Standard Freight Car Cylinder, Reservoir and Triple Valve.

(8 INCH DIAMETER BY 12 INCH STROKE.)

For cars weighing, when empty, over 15,000 and not more than 40,000 lbs., provided the total brake power amounts to 70% of the car weight, and is equally distributed to every wheel.

PLATE Q 29.



NOTE.—The Style "F" Triple Valve, Plate Q 6, must be used for this apparatus.

Standard Freight Car Cylinder, Reservoir and Triple Valve.

(8 INCH DIAMETER BY 12 INCH STROKE.)

PLATE Q 29.

No. 1. Standard Freight Cylinder, Reservoir and Triple Valve, complete.

DETAILS.

No.
2 Cylinder Body.
3 Piston and Rod (includes No. 5).
4 Back Head.
5 Follower Stud and Nut.
6 Follower.
7 Packing Leather.
8 Expander.
9 Release Spring.

No.
10 Reservoir (includes Nos. 11–12 and 16).
11 Drain Plug.
12 Reservoir Stud and Nut.
13 Cylinder-head Bolt and Nut.
14 Cylinder Gasket.
15 Triple-valve Gasket.
16 Oil Plug.

For Triple Valve, see Plate Q 6, Style "F"

"Standard Special" Freight Car Cylinder,

with Detached Auxiliary Reservoir and Triple Valve.

(8 INCH DIAMETER BY 12 INCH STROKE.)

For cars weighing, when empty, over 15,000 and not more than 40,000 lbs., provided the total brake power amounts to 70% of the car weight, and is equally distributed to every wheel.

PLATE Q 30.

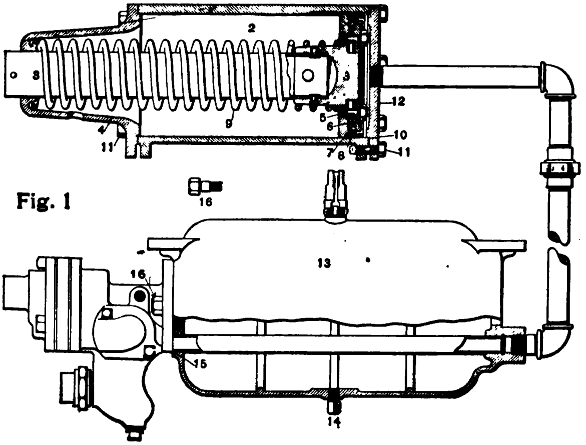


Fig. 1

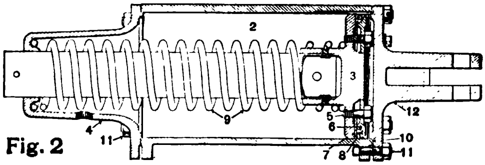


Fig. 2

"Standard Special" Freight Car Cylinder,

with Detached Auxiliary Reservoir and Triple Valve.

(8 INCH DIAMETER BY 12 INCH STROKE.)

PLATE Q 30,

Fig. 1. Standard Freight Cylinder, with Detached Auxiliary Reservoir and Triple Valve, complete.

DETAILS.

No.
1 Brake Cylinder, complete.
2 Cylinder Body.
3 Piston and Rod (includes No. 5).
4 Back Head.
5 Follower Stud and Nut.
6 Follower.
7 Packing Leather.
8 Expander.
9 Release Spring.

No.
10 Gasket.
11 Cylinder-head Bolt and Nut.
12 Flat Head.
13 Special Auxiliary Reservoir (includes Nos. 14 and 16).
14 Drain Plug.
15 Triple-valve Gasket.
16 Reservoir Stud and Nut.

For Triple Valve, see Plate Q 6, Style "F."

Fig. 2. Forked Head Brake Cylinder, complete.

DETAILS.

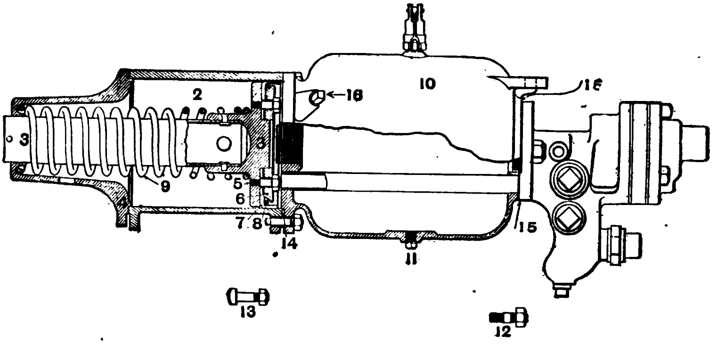
No.
2 Cylinder Body.
3 Piston and Rod (includes No. 5).
4 Back Head.
5 Follower Stud and Nut.
6 Follower.
7 Packing Leather.

No.
8 Expander.
9 Release Spring.
10 Gasket.
11 Cylinder-head Bolt and Nut.
12 Forked Head.

"Special" Freight Car Cylinder, Reservoir and Triple Valve.

(8 INCH DIAMETER BY 8 INCH STROKE).

PLATE Q 31.



NOTE.—This Cylinder and Reservoir should only be used where it is not possible to apply the apparatus shown on Plates Q 29 and 30. They develop as much power, but the stroke is shorter.

The Style "F" Triple Valve, Plate Q 6, must be used for this apparatus.

"Special" Freight Car Cylinder, Reservoir and Triple Valve,

(8 INCH DIAMETER BY 8 INCH STROKE.)

PLATE Q 31.

No. 1. "Special" Freight Cylinder and Reservoir, with Triple Valve, complete

DETAILS.

No.		No.	
2	Cylinder Body.	10	Reservoir (includes Nos. 11-12 and 13).
3	Piston and Rod (includes No. 5).	11	Drain Plug
4	Back Head.	12	Reservoir Stud and Nut.
5	Follower Stud and Nut	13	Cylinder-head Bolt and Nut
6	Follower.	14	Cylinder Gasket.
7	Packing Leather.	15	Triple-valve Gasket.
8	Expander.	16	Oil Plug.
9	Release Spring.		

For Triple Valve, see Plate Q 6, Style "F"

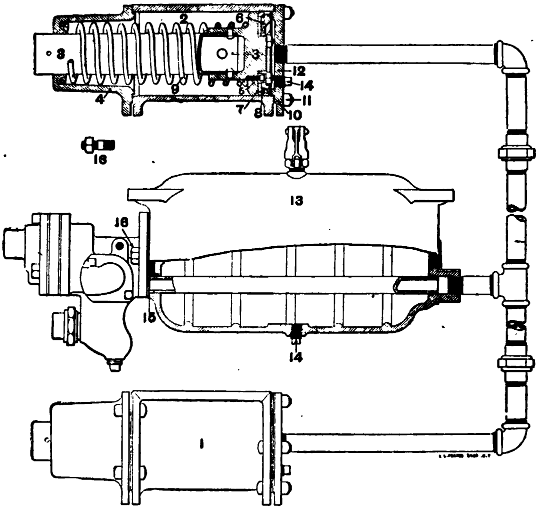
"Twin Cylinder" Freight Car Brake Apparatus,

with Detached Auxiliary Reservoir and Triple Valve.

(8-INCH DIAMETER BY 8 INCH STROKE.)

For cars weighing, when empty, over 15,000 and not more than 40,000 lbs., provided the total brake power amounts to 70% of the car weight, and is equally distributed to every wheel.

PLATE Q 32.



NOTE.—The Twin Cylinder equipment is only for use upon freight cars which are so constructed that the standard single cylinder brake cannot be used. The cylinders are usually so placed that one is near each truck. Larger sizes can be furnished if necessary

The Style "F" Triple Valve, Plate Q 6, must be used for this apparatus

"Twin Cylinder" Freight Car Brake Apparatus,

with Detached Auxiliary Reservoir and Triple Valve.

(6 INCH DIAMETER BY 8 INCH STROKE.)

PLATE Q 32.

"Twin Cylinder" Freight Car Apparatus; Cylinders with Detached Auxiliary Reservoir and Triple Valve, complete.

DETAILS.

No.
1 Brake Cylinder, complete.
2 Cylinder Body.
3 Piston and Rod (includes No. 5).
4 Back Head.
5 Follower Stud and Nut.
6 Follower.
7 Packing Leather.
8 Expander.
9 Release Spring.

No.
10 Gasket.
11 Cylinder-head Bolt and Nut.
12 Flat Head.
13 Special Auxiliary Reservoir (includes Nos. 14 and 16).
14 Drain Plug.
15 Triple-valve Gasket.
16 Reservoir Stud and Nut.

For Triple Valve, see Plate Q 6, Style "F"

Details of Freight Car Brake Apparatus.

PLATE Q 33.

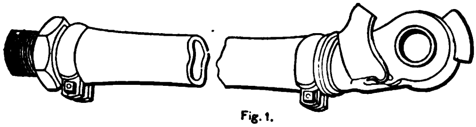


Fig. 1.

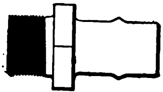


Fig. 4.

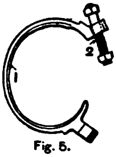


Fig. 5.

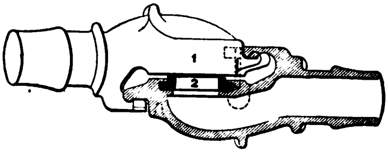


Fig. 2.

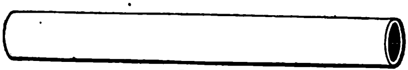


Fig. 3.

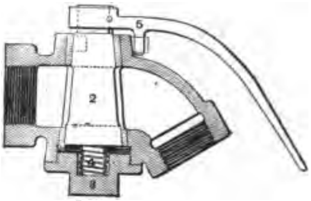


Fig. 6.

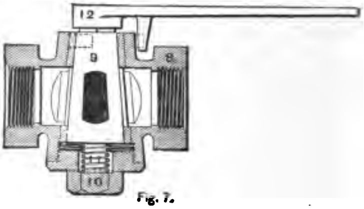


Fig. 7.

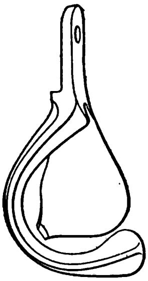


Fig. 8

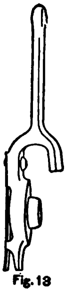


Fig. 13

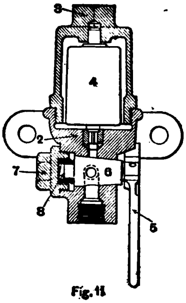


Fig. 11

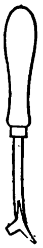


Fig. 12

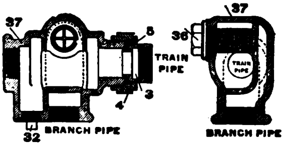


Fig. 9.

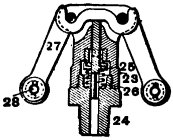


Fig. 10.

For Special Drain Cup, see Plate Q 34.

Details of Freight Car Brake Apparatus.

PLATE Q 33.

FIG. 1.

1¼ inch Hose and Coupling, complete.
(Order in Pairs.)

FIG. 2.

No.	
1	Standard 1¼ inch Coupling. (Order in Pairs.)
2	Packing Ring.

FIG. 3.

Standard 1¼ inch Hose.

FIG. 4.

1¼ inch Hose Nipple.

FIG. 5.

No.	
1	1¼ inch Hose Clamp.
2	Hose-clamp Bolt.

FIG. 6.

1¼ inch Angle Cock, complete.

DETAILS.

No.	
1	Body.
2	Plug.
3	Cap.
4	Spring.
5	Handle.

FIG. 7.

1¼ inch Cut-out Cock, complete.

DETAILS.

No.	
8	Body.
9	Plug.
10	Cap.
11	Spring.
12	Handle.

FIG. 8.

1¼ inch Coupling Hook. (See Fig. 13.)

FIG. 9.

No. 1. 1¼ inch Drain Cup, complete.

DETAILS.

No.	
37	Body.
3	Union Swivel.
4	Union Nut.
5	Gasket.
35	Strainer.
36	Spider.
32	Plug.

FIG. 10.

Release Valve, complete.

DETAILS.

No.	
23	Cylinder.
24	Stud.
25	Vent Valve.
26	Spring.
27	Handle.
28	Pin.
29	Cotter

FIG. 11.

Pressure Retaining Valve, complete.

DETAILS.

No.	
2	Body (includes Nos. 5–6–7 and 8).
3	Case.
4	Weight.
5	Handle.
6	Plug.
7	Cap.
8	Spring.

FIG. 12.

Coupling Groove Cleaning Tool.

FIG. 13.

1¼ inch Dummy Coupling.

Extra Details.

PLATE Q 34.

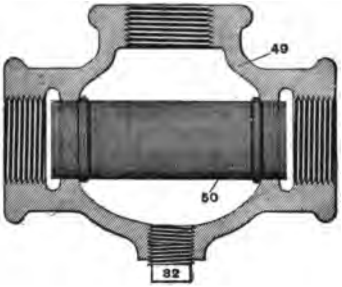


Fig. 1.

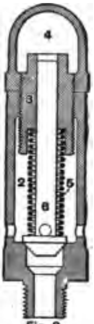


Fig. 2.

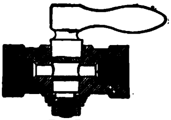


Fig. 5,

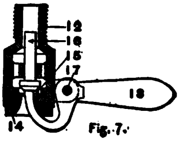


Fig. 7.

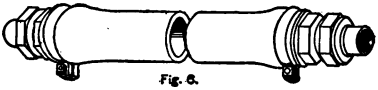


Fig. 6.

Extra Details.

PLATE Q 34.

FIG. 1.

Special Drain Cup, complete. (See the Note below.)

No.	DETAILS.
49	Body.
50	Strainer.
32	Drain Plug.

FIG. 2.

Safety Valve, complete.

No.	DETAILS.
2	Body.
3	Regulating Nut.
4	Cap.
5	Spring.
6	Valve.

FIG. 5.

½-inch Cut-out Cock for Duplex Governor.

FIG. 6.

Special Hose Connection, for use with Engine Truck Brakes.

FIG. 7.

Automatic Drain Cock, complete (for Main Reservoir).

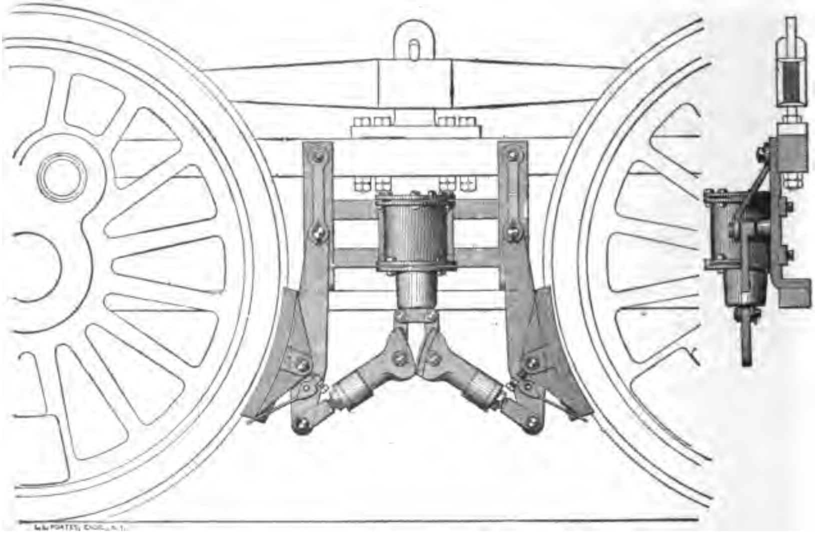
No.	DETAILS.
12	Body.
13	Handle.
14	Cap.
15	Valve Seat.
16	Valve.
17	Pin.

NOTE.—Our standard drain cup (Fig. 9, Plate Q 33) should be used in all cases where it can be placed in the normal position, *i. e.*, with the branch pipe opening at the bottom.

On some hopper-bottom cars, however, where the detached cylinder has to be placed high up at the end under the hopper, it often becomes necessary to place the drain cup in an inverted position, with the branch pipe led from the top. In such cases, the Special Drain Cup must be used, as our standard drain cup will not work well when inverted.

Cam Driving Wheel Brake.

STYLE A.



STYLES OF DRIVER BRAKES.

FOR EIGHT WHEEL PASSENGER ENGINES, AND FOUR WHEEL SWITCHERS.

STYLE A. Cam Spread Brake as above, on two pairs of wheels.

STYLE H. Outside Equalized Pull Brake, on forward side of two pairs of wheels. See opposite page.

FOR TEN WHEELERS, MOGULS AND SIX WHEEL SWITCHERS.

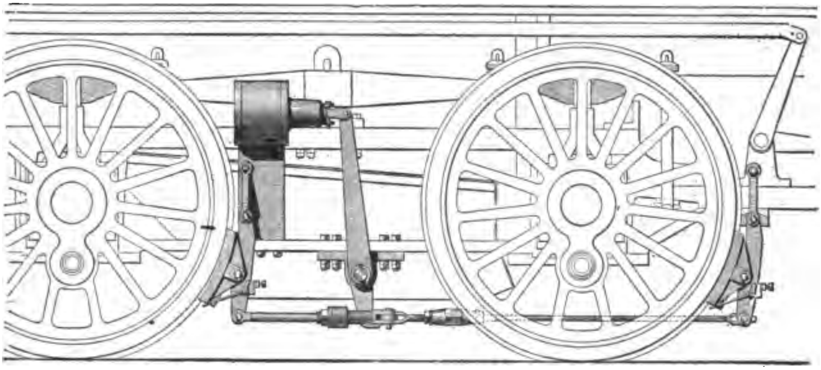
STYLE F. See opposite page.

FOR CONSOLIDATION ENGINES.

STYLE G. Same as opposite page, except on four pairs of wheels.

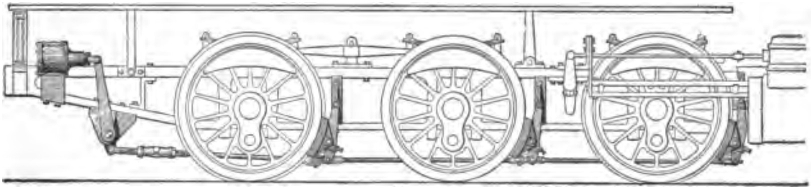
FOR THE FRONT TRUCK OF ENGINE.

STYLE K. Engine Truck Brake Fixtures (Levers, Shoes, etc.).



STYLE H.

Outside Equalized Brake on 2 Pairs of Driving Wheels.



STYLE F.

Outside Equalized Brake on 3 Pairs of Driving Wheels.

Schedules of Equipments.

SCHEDULE E 1. **Locomotive Equipment** *without* Driver Brake Apparatus; for Locomotives not provided with brakes acting upon the Driving Wheels:

1	No. 2 Duplex Air Pump, complete with Oil Cups, Drain Cock, and Wrenches.
1	Positive Discharge Engineer's Brake Valve, complete with Supplementary Reservoir and 1 inch Cut-out Cock.
1	1 inch Pump Governor (Plate Q 7, Style B).
1	1 inch Steam Valve.
1	Duplex Air Gauge.
1	1 inch Reservoir Union.
1	1¼ inch Reservoir Union.
1	Automatic Drain Cock for Main Reservoir.
1	Pair 1 inch x 22 inch Complete Coupling Hose.
2	1 inch x 1¼ inch Angle Fittings.
1	1 inch Stop Cock.
1	1 inch Dummy Coupling.

SCHEDULE E 2. **Full Locomotive Equipment,** including parts for operating Driving Wheel Brakes, corresponding to Westinghouse Schedule A 1. This equipment is same as Schedule E 1, with the following parts added

2	Driver Brake Cylinders of suitable size and kind.
1	Auxiliary Reservoir of size required.
1	Reservoir Drain Cock.
1	Triple Valve (Plate Q 4 or Q 5) with Bracket and Nipple.
1	½ inch Cut-out Cock.
1	1 inch Drain Cup.

SCHEDULE E 3. **Tender Equipment,** corresponding to Westinghouse Schedule B 1.

1 Tender Brake Cylinder of size and kind required.
1 Auxiliary Reservoir of size required.
1 Reservoir Drain Cock.
1 Triple Valve (Plate Q 4) with Bracket and Nipple.
1 ½ inch Cut-out Cock.
1 1 inch Tender Drain Cup complete with Drain Cock.
1 1¼ inch Angle Cock with 1 inch Reducer.
1 Pair 1 inch x 22 inch Complete Coupling Hose.
1 1 inch x 1¼ inch Angle Fitting.
1 1 inch Dummy Coupling.

SCHEDULE D A. **Driver Brake Apparatus** (parts to operate Driving Wheel Brakes when the latter are added to engines already equipped for operating train brakes only), corresponding to Westinghouse Schedule D 1.

2 Driver Brake Cylinders of suitable size and kind.
1 Auxiliary Reservoir of size required.
1 Reservoir Drain Cock.
1 Triple Valve (Plate Q 4 or Q 5) with Bracket and Nipple.
1 ½ inch Cut-out Cock.
1 1 inch Drain Cup.

SCHEDULE T A. **Engine Truck Brake Apparatus,** (parts to operate brakes acting upon the Engine Truck Wheels, when the engine is otherwise fully equipped), corresponding to Westinghouse Schedule D 2.

1 Engine Truck Brake Cylinder of size and kind required.
1 Auxiliary Reservoir of size required.
1 Reservoir Drain Cock.
1 Triple Valve (Plate Q 4) with Bracket and Nipple.
1 ½ inch Cut-out Cock.
1 1 inch Drain Cup.
1 Piece 1 inch x 22 inch Hose with suitable connections.

SCHEDULE P C P. **Parts for Changing Pressure,** similar to Westinghouse Schedule U.

1 Set of parts to change the Standard Governor (Plate Q 7) to a Duplex Governor (Plate Q 8).
1 ½ inch Cut out Cock for Governor.
2 Safety Valves (one each for driver brake cylinders and tender cylinder). If the engine is equipped with front truck brakes, one more Safety Valve will be furnished for the front truck cylinder.

SCHEDULE E C. **Small Passenger Car Equipment,** for cars weighing less than 32,000 lbs.

1 Special 8 inch Car Cylinder and Reservoir (Plate Q 20), complete with Quick Action Triple Valve (Plate Q 6. Style P).
1 ¾ inch Conductor's Valve.
1 Pair 1 inch x 22 inch Complete Coupling Hose.
2 1¼ inch Angle Cocks with 1 inch Reducers.
1 1 inch Cut-out Cock.
1 Reservoir Drain Cock.
1 1 inch Car Drain Cup.
2 1 inch Dummy Couplings.

SCHEDULE S C. **Standard Passenger Car Equipment,** (for cars weighing from 32,000 to 50,000 lbs.), corresponding to Westinghouse Schedule C 1.

1 10 inch Car Brake Cylinder.
1 12 inch x 33 inch Auxiliary Reservoir.
1 Quick Action Triple Valve (Plate Q 6, Style P), and Gasket No. 15 (Plate Q 21).
1 ¾ inch Conductor's Valve.
1 Pair 1 inch x 22 inch Complete Coupling Hose.
2 1¼ inch Angle Cocks with 1 inch Reducers.
1 1 inch Cut-out Cock.
1 Reservoir Drain Cock.
1 1 inch Car Drain Cup.
2 1 inch Dummy Couplings.

SCHEDULE R C. **Large Passenger Car Equipment,** (for cars weighing over 50,000 and up to 70,000 lbs.), corresponding to Westinghouse Schedule R.

1 12 inch Car Brake Cylinder.
1 14 inch x 33 inch Auxiliary Reservoir.
1 Special Quick Action Triple Valve (Plate Q 24), and Gasket No. 15 (Plate Q 22).
1 ¾ inch Conductor's Valve.
1 Pair 1 inch x 22 inch Complete Coupling Hose.
2 1¼ inch Angle Cocks with 1 inch Reducers.
1 1 inch Cut-out Cock.
1 Reservoir Drain Cock.
1 1 inch Car Drain Cup.
2 1 inch Dummy Couplings.

SCHEDULE H C. **"Special" Passenger Car Equipment,** (for cars weighing over 70,000 lbs.), corresponding to Westinghouse Schedule P.

1 14 inch Car Brake Cylinder.
1 16 inch x 33 inch Auxiliary Reservoir.
1 Special Quick Action Triple Valve (Plate Q 24), and Gasket No. 15 (Plate Q 23).
1 ¾ inch Conductor's Valve.
1 Pair 1 inch x 22 inch Complete Coupling Hose.
2 1¼ inch Angle Cocks with 1 inch Reducers.
1 1 inch Cut-out Cock.
1 Reservoir Drain Cock.
1 1 inch Car Drain Cup.
2 1 inch Dummy Couplings.

SCHEDULE C F. **"Standard" Freight Car Equipment** (Combined Apparatus). (for cars weighing over 15,000 and not more than 40,000 lbs), corresponding to Westinghouse Schedule H 1.

1 Standard Freight Cylinder, Reservoir, and Triple Valve, complete (Plate Q 29).
1 Pressure Retaining Valve.
1 Release Valve.
1 1¼ inch Car Drain Cup.
2 1¼ inch Angle Cocks.
1 1¼ inch Cut-out Cock.
1 Pair 1¼ inch x 22 inch Complete Coupling Hose.

SCHEDULE D F. **"Standard Special" Freight Car Equipment** (Detached Apparatus) (for Cars weighing over 15,000 and not more than 40,000 lbs.), corresponding to Westinghouse Schedule H 2.

1 Freight Cylinder (either Fig. 1 or Fig. 2, Plate Q 30).
1 Detached Auxiliary Reservoir and Triple Valve (Plate Q 30).
1 Pressure Retaining Valve.
1 Release Valve.
1 1¼ inch Car Drain Cup.
2 1¼ inch Angle Cocks.
1 1¼ inch Cut-out Cock.
1 Pair 1¼ inch x 22 inch Complete Coupling Hose.

SCHEDULE S F. **"Special" Freight Car Equipment** (Short Stroke Apparatus) (for use when there is not room for the standard length), corresponding to Westinghouse Schedule H 3.

1 Short Stroke Cylinder, Reservoir, and Triple Valve, complete (Plate Q 31).
1 Pressure Retaining Valve.
1 Release Valve.
1 1¼ inch Car Drain Cup.
2 1¼ inch Angle Cocks.
1 1¼ inch Cut-out Cock.
1 Pair 1¼ inch x 22 inch Complete Coupling Hose.

Dummy Couplings extra; not furnished unless specified; price 16 cents NET per pair for either New or Old style.

SCHEDULE C N F. **"Narrow Gauge" Freight Car Equipment** (Combined Apparatus) (for cars weighing 15,000 lbs. or less), corresponding to Westinghouse Schedule H 4.

1 Narrow Gauge Freight Cylinder, Reservoir, and Triple Valve, complete (Plate Q 27).
1 Pressure Retaining Valve.
1 Release Valve.
1 1¼ inch Car Drain Cup.
2 1¼ inch Angle Cocks.
1 1¼ inch Cut-out Cock.
1 Pair 1¼ inch x 22 inch Complete Coupling Hose.

SCHEDULE D N F. **"Special Narrow Gauge" Freight Car Equipment** (Detached Apparatus) (for cars weighing 15,000 lbs. or less), corresponding to Westinghouse Schedule H 5.

1 Special Narrow Gauge Freight Cylinder (Plate Q 28).
1 Special Narrow Gauge Reservoir and Triple Valve, complete (Plate Q 28).
1 Pressure Retaining Valve.
1 Release Valve.
1 1¼ inch Car Drain Cup.
2 1¼ inch Angle Cocks.
1 1¼ inch Cut-out Cock.
1 Pair 1¼ inch x 22 inch Complete Coupling Hose.

SCHEDULE T F. **Twin Cylinder Freight Car Equipment** (Twin Cylinders and Detached Reservoir). (for cars weighing over 15,000 and not more than 40,000 lbs.), corresponding to Westinghouse Schedule H 6.

2 Brake Cylinders 6 inch x 8 inch.
1 Standard Detached Reservoir and Triple Valve, complete (Plate Q 32).
1 Pressure Retaining Valve.
1 Release Valve
1 1¼ inch Car Drain Cup.
2 1¼ inch Angle Cocks.
1 1¼ inch Cut-out Cock.
1 Pair 1¼ inch x 22 inch Complete Coupling Hose.

SCHEDULE H F. **"Large" Freight Car Equipment** (for cars weighing over 40,000 lbs.).

1 Brake Cylinder 10 inch x 12 inch (of style required).
1 Auxiliary Reservoir 12 inch x 33 inch.
1 Quick Action Triple Valve (Plate Q 6, Style P) and Gasket.
1 Pressure Retaining Valve.
1 Release Valve.
1 1¼ inch Car Drain Cup.
2 1¼ inch Angle Cocks.
1 1¼ inch Cut-out Cock.
1 Pair 1¼ inch x 22 inch Complete Coupling Hose

SCHEDULE E S. **Train Signal for Locomotive and Tender,** corresponding to Westinghouse Schedule J.

1 Signal Valve.
1 Reducing Valve.
1 Signal Whistle.
2 Pairs ¾ inch Complete Signal Hose, with Angle Fittings attached.
2 ¾ inch Stop Cocks.
1 ½ inch Stop Cock.
2 Signal Dummy Couplings.

SCHEDULE C S. **Train Signal for Passenger Car,** corresponding to Westinghouse Schedule K.

1 Car Discharge Valve.
1 Pair ¾ inch Complete Signal Hose, with Angle Fittings attached.
2 ¾ inch Stop Cocks.
1 ½ inch Cut-out Cock.
1 Signal Pipe Strainer.
2 Signal Dummy Couplings.

SCHEDULE C E. **To Change Locomotive and Tender** from Old to New Automatic, corresponding to Westinghouse Schedule L.

1 Positive Discharge Engineer's Brake Valve, complete with Supplementary Reservoir and 1 inch Cut-out Cock.
1 Duplex Air Gauge.
1 1 inch Reservoir Union.
1 Angle Cock with 1 inch Reducer.
1 Pair 1 inch x 22 inch Complete Coupling Hose.
2 1 inch x 1¼ inch Angle Fittings.
1 1 inch x 1¼ inch Hose Nipple.
Necessary Pipe and Pipe Fittings.

SCHEDULE C P C. **To Change Car From Old to New Automatic,** corresponding to Westinghouse Schedule M.

1 10 inch Front Cylinder Head.
2 ⅝ inch x 4½ inch Bolts.
1 Quick Action Triple Valve (Plate Q 6, Style P).
1 1 inch Car Drain Cup.
1 1 inch Cut-out Cock.
2 Angle Cocks with 1 inch Reducers.
2 1 inch x 1¼ inch Hose Nipples.
1 Piston Cross Head for 1 3/16 inch Pin and Lever.
Necessary Pipe and Pipe Fittings.

Usual Quantity of Pipe and Pipe Fittings Required:

For applying the Brake to a Locomotive and Tender, including Driver Brakes:

10 to 30 ft. 1¼ in. Pipe.
60 " 125 " 1 in. "
20 " 45 " ½ in. "
5 " 15 " ¼ in. "
20 " 35 " ⅜ in. Copper Pipe.
3 " 5 Nipples, ½ in. x 2 in.
1 " 3 Ells, ¼ in.
2 " 5 " 1 in.
4 to 6 Ells, ½ in.
1 Tee, 1 in.
1 " 1 in. x 1 in. x ½ in.
1 Coupling, ¼ in.
1 or 2 Unions, 1 in.
3 to 6 " ½ in.
1 " ¼ in.

For applying the Brake to a Passenger Car:

55 to 90 ft. 1 in. Pipe.
15 “ 30 “ ¾ in. “
1 or 2 Ells, 1 in.
1 to 3 “ ¾ in.

1 or 2 Street Ells, 1 in.
1 Tee, 1 in. x 1 in. x ¾ in.
2 Unions, ¾ in.

For applying the Brake to a Freight Car:

35 to 45 ft. 1¼ in. Pipe.
15 “ 35 “ ¾ in. “
0 or 1 Ell, 1¼ in.
0 “ 1 “ 1¼ in. x 1 in.

0 or 1 Street Ell, 1¼ in.
0 “ 1 “ “ 1 in.
1 “ 2 Ells, ¾ in.
1 Union, ¾ in.

NOTE:—The above list applies to Clear Bottom Cars. For Hopper Bottom Cars and those requiring unusual location of brake apparatus, a larger quantity of pipe and pipe fittings is required.

For applying the Compressed Air Train Signal to a Locomotive and Tender:

50 to 75 ft. ¾ in. Pipe.
10 “ 30 “ ½ in. “
5 “ 15 “ ¼ in. “
1 Nipple ¾ in. x 4 in.
0 to 3 Ells, ¾ in.
1 “ ¼ in.

1 to 3 Ells, ½ in.
2 Tees, ¾ in. x ¾ in. x ½ in.
1 Coupling, ¼ in.
0 to 2 Unions, ¾ in.
2 or 3 “ ½ in.

For applying the Compressed Air Train Signal to a Passenger Car:

50 to 80 ft. ¾ in. Pipe.
12 “ 25 “ ½ in. “
2 Nipples, ¾ in. x 4 in.

2 or 3 Ells, ½ in.
1 Union, ¾ in.
0 or 1 “ ½ in.

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